Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities

Annual Report
2003

DOE/BP-00003992-4

February 2004

This Document should be cited as follows:

Martinson, Rick, Jeffrey Kamps, Gregory Kovalchuk, Dean Ballinger, ''Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities'', Project No. 1987-12700, 83 electronic pages, (BPA Report DOE/BP-00003992-4)

Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA.

MONITORING OF DOWNSTREAM SALMON AND STEELHEAD AT FEDERAL HYDROELECTRIC FACILITIES - 2003
Annual Report

Prepared By
Rick D. Martinson
Jeffrey W. Kamps
Gregory M. Kovalchuk
Dean Ballinger

Pacific States Marine Fisheries Commission
205 SE Spokane St, Suite 100
Portland, Oregon 97202-6413

Prepared For
Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, Oregon 97208

Project 87-127-01
(98-FG-02117)

February 04

TABLE OF CONTENTS

Abstract.—The 2003 spring flows were within 7 kcfs of last year's flows, but the summer flows were significantly lower, averaging 194 kcfs compared to 278 kcfs last year. Late summer and fall flows were within 20 kcfs of last year's flows. These flow levels provided good migration conditions for juvenile salmonids, comparable to last year, except in June and July. Monthly average river flows were lower than the historical averages.

The number of fish handled at John Day decreased from 257,741 last year to 166,209 this year. Part of this decline is due to reduced research effort which lowers the total number of fish needed. Descaling, compared to last year, varied by species, increasing for yearling chinook and clipped and unclipped steelhead, decreasing for coho and sockeye, and remaining about the same for subyearling chinook. Descaling was well below the average for the airlift years for all species except unclipped steelhead. This may be a function of unclipped hatchery steelhead being counted as unclipped steelhead, a category traditionally reserved for wild steelhead. Mortality continues to be low, at or below last year's levels for yearling chinook, subyearling chinook, clipped steelhead and sockeye; slightly higher than last year for unclipped steelhead and coho. With the exception of sockeye, mortality rates at the new facility are well below the average for the years of sampling with the airlift system.
The spring migrants generally started migrating later and finished earlier, for a shorter overall duration. Subyearling chinook did just the opposite, starting earlier and ending later for a longer middle 80% duration.

This was the fourth year of index level sampling at the Hamilton Island Juvenile Monitoring Facility at Bonneville. The number of fish handled declined from 85,552 last year to 80,303 this year. Descaling for all species was similar to the previous two years (within 2%) but in all cases lower than the historical average. Mortality was lower than last year for all species, and below 1% for all species except sockeye (1.9%). Passage timing and duration was similar to last year for all species.

A total of 5,542 fish were handled in the first powerhouse for condition monitoring and gas bubble exams. Fish condition was good, with descaling and mortality below last year's levels for all species.

Powerhouse 2 operational priority reduced operation of PH1 again this year especially in midsummer as river flow declined. This prompted a 31 July end to a season that was scheduled to go through August. After 23 June exams for gas bubble trauma symptoms were conducted in the Juvenile Monitoring Facility. A total of 3,473 fish were examined and only one fish with bubbles was observed.

PREFACE

Project 84-014 has been part of the annual integrated and coordinated Columbia River Basin Smolt Monitoring Program since 1984, and currently addresses measure 5.9A.1 of the 1994 Northwest Power and Conservation Planning Council's (NPCC) Fish and Wildlife Program. The program is coordinated by the Fish Passage Center (FPC) and funded by the Bonneville Power Administration (BPA). The National Marine Fisheries Service, now known as NOAA Fisheries, established the project to: 1) collect and report daily fish capture, fish condition, dam operations, and river flow data to water managers to improve the scientific information on which to base in-season operations of the hydro system, and 2) analyze the collected data and characterize juvenile fish passage at main stem federal dams and transfer this information, learning, and understanding to the fisheries community through technical reports and publications. In the 1980s, NOAA Fisheries conducted the smolt monitoring at Lower Granite, Lower Monumental, McNary, John Day, and Bonneville dams. Since the early 1990s, the smolt monitoring at the Snake River dams and McNary Dam was assumed by the states of Washington and Oregon, and this project (84-014) retained responsibility for monitoring at John Day, The Dalles (1989 - 1991), and Bonneville dams.

In 1999 the contract for project 84-014, which was the remaining federal portion of the Smolt Monitoring Program (SMP), was not renewed. The work done under this contract was combined with the non-federal portion of the SMP, project 87-127. The remaining NOAA Fisheries employees converted to Pacific States Marine Fisheries Commission (PSMFC) employees and the NOAA Fisheries withdrawal from the SMP was complete. This consolidation was done to facilitate review and reduce administrative costs.

The following report presents the results of the SMP activities at John Day and Bonneville dams this year as well as summaries of data for all years of the project at John Day and Bonneville dams.

INTRODUCTION

The seaward migration of juvenile salmonids was monitored by the PSMFC at John Day Dam, located at river mile 216, and at Bonneville Dam, located at river mile 145 on the Columbia River (Figure 1). The PSMFC Smolt Monitoring Project is part of a larger SMP coordinated by the FPC for the Columbia Basin Fish and Wildlife Authority. This program is carried out under the auspices of the NPPC's Fish and Wildlife Program and is funded by the BPA.

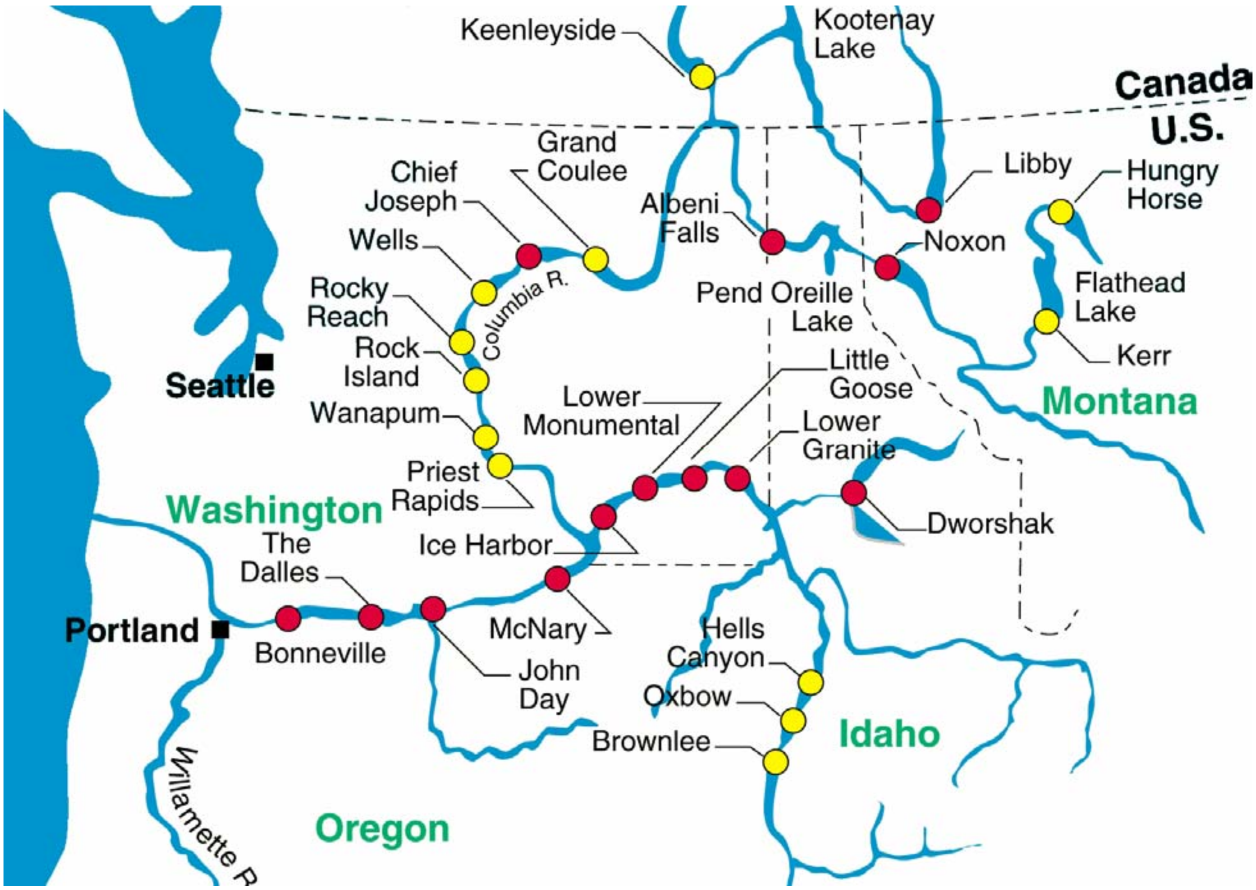


Figure 1. Hydroelectric projects on the Snake and Columbia Rivers. This figure is reprinted courtesy of the U.S. Army Corps of Engineers, Portland District.

The purpose of the SMP is to monitor the timing and magnitude of the juvenile salmonid out-migration in the Columbia Basin and make flow and spill recommendations designed to facilitate fish passage. Data are also used for travel time and survival estimates and to build a time series data set for future reference. The purpose of the PSMFC portion of the program is to provide the FPC with species and project specific real time data from John Day and Bonneville dams.

METHODS AND MATERIALS

JOHN DAY DAM

Sampling

John Day Dam is equipped with a juvenile bypass system (Figure C-10) consisting of Submersible Traveling Screens (STSs), gatewells, 14 inch orifices, and a tainter gate. As fish exit the bypass channel under the tainter gate, they are directed either back to the river or down the elevated chute toward the Smolt Monitoring Facility (SMF), depending on the position of the crest gate. At the end of the elevated chute is the Primary Dewatering Structure

(PDS). The PDS removes all but 30 cubic feet per second (cfs) of the roughly 450 cfs entering it. This remaining 30 cfs and all the fish travel down a corrugated flume equipped with a switch gate, which directs the flow to either the bypass (back to river) or sample (to sampling facility) flumes. In sample mode, the fish pass over the Secondary Dewatering Structure (SDS) where an additional 29 cfs are removed. The remaining water and fish exit the SDS and enter the large fish and debris separator (FDS), a series of parallel aluminum bars that allow the juveniles to pass through the bars while the adults and debris slide off the end and return to the river. Under the separator bars is a collection area known as the hopper, a sloped floor basket that directs the juveniles into the distribution flume leading to the Passive Integrated Transponder (PIT) tag coils and rotating gates.

The 3-way rotating gate is used to obtain the general sample and research fish. When rotated to the west, all fish are diverted into the sample tank, when rotated to the east, all fish are routed to the research flume, and in the center or default position all fish go directly to the river. The system also has a feature called Divert during sample (DDS) which is activated when the sample rate is 20% or above when SBC fish are being collected. The research flume contains a 2-way rotating gate capable of selecting specific PIT tagged fish for diversion to a different tank, making it possible to collect fish for two different studies concurrently and hold them in separate tanks. This feature, together with the initial diversion at the 3-way gate, is referred to as the Separation by Code (SBC) system (Figure A-12).

The sample day began at 0700 hours and went to 0700 hours the next day. This is consistent with other smolt monitoring and transportation sites. Depending on the sample rate, 2 - 6 timed subsamples were collected each hour using the 3-way rotational gate. The sample rate range for smolt monitoring is 0.5% to 25%. The method for selecting a particular daily sample rate varied depending on the number of fish anticipated for smolt monitoring and United States Geological Survey (USGS) research needs the following day. Current passage trends helped us make educated guesses at in-river increases and decreases, but variation in flow and spill conditions created dynamic situations. When higher than normal sample sizes were needed to fulfill research requests, the sample rate was increased accordingly based on previous days' passage trends. Due to specific species, size, condition, and tag or brand criteria, the subsequent sample size was often many times that which would have satisfied normal SMP goals (Figure A-6). For a summary of sample rates, openings per hour, and other details, see Table 1. Sample rates above 25% are possible if needed for research fish collection.

During the spring migration, when species diversity is greatest, the target sample size range was 500 - 750 fish per day. During the summer migration, with mainly subyearling chinook present, the target sample size range was 150 - 250 fish per day. Sample rates were adjusted as needed to achieve these target sample sizes.

Fish were processed between 1300 and 1400 hours and at 0700 hours daily and the results combined for a sample day total. Fish collected at different sample rates were separated and expanded based on their respective sample rates and referred to as a subbatch. For a list of data collected, see Data Collected in the John Day and Bonneville section (pg. 6).

Fish were collected in a 6,796 liter (1,795 gal) holding tank located inside of the sampling lab. At the end of a sample period, the crowder was moved forward and the next sample was collected behind it. When circumstances required holding more than two subbatches at a time, a removable panel was inserted to keep subbatch groups separate. Approximately 150 smolt were then crowded into a 20 by 24 inch pre-anesthetic (PA) chamber using a panel net. The water level in the PA chamber was lowered to about 8 inches (48 liters) and fish were anesthetized with MS-222 at a concentration of about 63 mg/l. Average induction time was approximately 2 minutes in 2003. Once anesthetized, fish were routed via a 6 inch PVC pipe over a final dewatering screen and into the examination trough. MS-222 was added to the examination trough as needed to keep smolt anesthetized.

When large numbers of fish are being processed, a recirculating system is used to reduce MS-222 usage and a chiller is used to keep examination trough water within 1.5^0F of river temperature. An inline water filtration system was added to the recirculation system in 2000 to minimize the possibility of inadvertently culturing and spreading pathogens such as bacteria and fungus in the recirculating examination water. The system consists of three Rainbow Plastics UV Sterilizer filters (40 watt), a Venturi Protein skimmer, and two sets of particulate bag filters (100 and 20 micron). The bag filters were switched and cleaned daily or as needed (Figure A-9).

BONNEVILLE DAM

Sampling - Second Powerhouse

The second powerhouse (PH2) at Bonneville is equipped with a juvenile bypass system (Figure C-10) consisting of STS's, gatewells, 12 inch orifices, and vertical wall screens that remove all but 30 cfs of the roughly 340 cfs in the bypass channel. At the end of the screened section is the entrance to the 1.7-mile conveyance pipe that leads to the Hamilton Island Juvenile Monitoring Facility (JMF). A switchgate at the exit of the pipe directs the flow to either the sampling facility or directly back to the river. In the sample position, the 30 cfs in the flume flows into the PDS where it is reduced to about 0.5 - 1 cfs that empties onto the FDS (see description in John Day section above). As fish exit the hopper area under the separator bars, they travel down a flume toward the first set of PIT tag coils. These coils can be used to activate the 3-way rotational gate to divert fish with specific PIT tag codes into one of two holding tanks in the basement of the facility. This is the SBC system (Figure B-9). Just downstream of the 3-way rotational gate on the default center flume is the 2-way rotational gate. The 2-way gate is used exclusively to collect timed subsamples for smolt monitoring. This system differs from John Day where the 3-way gate is used for initial SBC and SMP sample collection and the 2-way gate, which is on the SBC flume, is used for subdivision of SBC fish. Collected fish are routed to an 18,930 liter (5,000 gallon) holding tank in the basement. Because the JMF is 1.7 miles from the powerhouse, head loss made it necessary to put the holding tanks in the basement of the JMF. All of the holding tanks are equipped with crowders used to crowd fish to the fish lift end of the holding tank and to separate fish collected on different sample days, or fish collected at different sample rates within the same sample day. Fish collected at different sample rates (subbatches) are processed and expanded separately.

The processing area is on the main floor so fish lifts, or fish elevators, are used to transport the fish upstairs. The fish lifts, which measure 24 by 27 inches, also function as PA chambers. Approximately 125 smolt were crowded into the PA chamber, the water was lowered to about 10 inches (104 liters), and fish were anesthetized with MS-222 at a concentration of about 39 mg/l. When the fish were partially anesthetized, the fish lift was hoisted to the main floor. Once anesthetized, fish traveled through a 20 foot piece of 6 inch PVC pipe to a final dewatering device and then into the examination trough. MS-222 was added to the examination trough as needed to keep fish anesthetized. Following examination, fish were routed via a 4 inch PVC pipe to a recovery tank and held for a minimum of 30 minutes before being released. Upon release, fish pass through one more set of PIT tag coils before returning to the bypass flume. Downstream of where they enter the bypass flume is another switch gate that directs the flow to either the high water or low water outfall. The system automatically switches from one outfall to the other depending on tailwater elevation.

The sample day began at 0700 hours and concluded at 0700 hours on the next day. Depending on the sample rate, 2 - 6 timed subsamples were collected each hour using the 2-way rotational gate. The sample rate range for smolt monitoring is 0.5% to 25%. During the spring migration, when species diversity is greatest, the target sample size was 500 - 750 fish per day. During the summer migration, with mainly subyearling chinook present, the target sample size was 150 - 250 fish per day. Sample rates were adjusted as needed to achieve these target sample sizes. When the sample rate is 20% or above, the system is put into DDS mode (see explanation in John Day section). For a summary of sample rates, openings per hour, and other details, see Table 1. Sample rates above 25% are possible if needed for research fish collection.

PH2 diagrams showing the footprint of the facility and the schematic of the lab are presented in Figures B-8 and B-9, respectively. Please see Krcma et al. (1984) for a description of the system used prior to 1997. For a description of the system used in 1997 and 1998 see Martinson, et al. (1998) and for diagrams of the system see Figure B-11 and B-12. Figure B-8 shows the fish processing area of PH2 used through 1998.

First Powerhouse

The first powerhouse (PH1) has a bypass system (Figure C-10) consisting of STSs, gatewells, orifices, bypass channel, and outfall. At the end of the bypass channel, there is an inclined floor screen that removes most of the water in the channel. At the end of the floor screen section, the fish and remaining water plunge into an area called the downwell, which leads to the tailrace. The 2,415 liter (638 gal) trap used to collect samples is positioned in the downwell and the water and fish are directed into it with a small movable screen section. For further explanation see Gessel et al. (1986) and for a cross sectional diagram see Figure C-8.

Sampling occurred between 1600 and 2400 hours on Monday and Thursday for condition monitoring and Gas Bubble Trauma (GBT) exams. On Saturdays, only condition monitoring was conducted. There was no fish collection for research purposes this year. The sampling effort was adjusted from 30 seconds to 15 minutes per set depending upon passage numbers. Typically, 15 to 25 fish per set was optimal for condition and GBT monitoring. Collected fish were routed from the trap to a holding tank via a rectangular chute. From there, fish were crowded into a PA chamber and anesthetized using a stock solution of MS-222 with a concentration of 50 g/l. Once anesthetized, fish were net transferred from the holding tank to the examination trough. MS-222 is added to the examination trough as needed to minimize stress during examination. After processing, sampled fish were scanned for PIT tags before going to a recovery tank and any tags found are reported to PTAGIS in a recapture file. Fish were allowed to recover for at least 30 minutes before being released into the downwell via a 6 inch PVC pipe (Figure C-9).

Flat Plate Operation

Full bypass PIT tag detections in PH1 began in 1996 when a prototype system called a flat plate was attached to the top of the sample collection trap. The impetus for the system was a NOAA Fisheries survival study. Two antennae are encased in a housing and PIT tags are detected as fish pass over the top of the housing. In 2000, the system was converted from 400 kHz to 134.2 kHz, which is the international standard. The 134.2 kHz system provides better read rates and ranges. The flat plate has pneumatic cylinders that lift it up and away from the trap, allowing fish to be collected. To end fish collection and resume interrogation for PIT tags, the flat plate housing is lowered back onto the trap and fish are directed onto it rather than into the trap. Flat plate efficiency is affected by water depth and fish orientation.

Gas Bubble Trauma Subsampling

Samples to examine fish for symptoms of gas bubble trauma (bubbles) were collected twice weekly, usually on Mondays and Thursdays. The number of fish targeted for each session was 100, and could be a combination of chinook and steelhead. Exams focused on unpaired fins and eyes using a variable power, dissecting microscope (6X to 40X). Bubbles were quantified as the "percent of area occluded" and assigned a severity ranking as follows: less than 5% = 1, 6% - 25% = 2, 26% - 50% = 3, greater than 50% = 4 (Fish Passage Manager, 1999, p33). Results were summarized, recorded, and transmitted to the FPC.

JOHN DAY AND BONNEVILLE

Subsampled Fish Condition

Detailed fish condition monitoring targeted a sample size of at least 100 individuals per species in the spring, three or four days per week. The sampling crew attempted to choose fish at random and to select fish throughout the sample day. Steelhead and sockeye were examined one day while yearling chinook and coho were examined every alternate day. Target sample sizes of 200 (John Day) or 100 (Bonneville) subyearling chinook were examined every day of the week from June to September (JDA) or October (PH2). In addition to fin clips, tags, and brands, smolts were examined for descaling, injuries to the head and body, parasites, disease, predation, and fork lengths.

New in 2003, an AIPTEK brand graphic tablet was used to record detailed subsample condition data. Fork length was taken by placing the fish on the wetted digitizer platform, while all other data was entered while the subject remained in the sorting trough. This method utilized a custom made program which recorded and saved species, fork length, time, subbatch information, and various condition data. Electronic sample tally counters were used in conjunction with grease boards and digitizer data to record subbatch totals. Following examination, all sampled fish were routed to recovery tanks and held for a period of at least 30 minutes before being released. This process was repeated until the entire sample had been examined. All holding and recovery tanks had a constant exchange of river water. Upon release, fish pass through one more set of PIT tag coils before returning to the bypass flume. Drawings of the labs and the footprint of the facilities are presented in Figures A-12 and A-13 for John Day and Figures B-9 and B-10 for Bonneville.

Performance Monitoring

Tests and digital imaging were used to evaluate species identification, brand recognition, descaling assessment, and data recording accuracy of SMP personnel during 2003. During tests, a subsample of ten fish were randomly selected, anesthetized, and placed into a compartmentalized divider located in the sorting trough. Each sorter independently processed and recorded specific details for each fish including: 1) species, 2) fin clip, 3) level of descaling, and 4) presence of external marks or tags. Fish were held briefly while coworkers compared results, allowing discrepancies to be discussed with fish in hand. Photographs were also valuable for documenting unknowns, discrepancies, and oddities, which could be examined later with no risk to the fish.

Data Collected
The following is a list of data collected daily and either manually sent to the FPC or automatically uploaded to the Columbia Basin PIT Tag Information System.

1) Species specific subbatch and daily sample totals.
2) Brands, tags, fin clips, and PIT tag detections.
3) Descaling and mortality data.
4) Species specific length and condition data (subsampling only).
5) River, powerhouse, and spill flow data.
6) Facility water quality parameters (Temp and % TDG).

DEFINITION OF TERMS

Three types of numbers are discussed in the report, defined as follows:

1) Total Sample: actual fish counts, number of fish handled. (ex. Sample, n = 100)

2) Estimated Collection: total sample number divided by sample rate, resulting in an estimated number of fish passing through the juvenile bypass system. (ex. Sample rate = .1, Collection, C = n/.1 = 1000)

3) Fish Passage Indices: estimated collection counts divided by the proportion of flow passing through the powerhouse where those fish were collected resulting in a relative indicator of fish abundance with no adjustment for Fish Guidance Efficiency, horizontal, vertical or temporal fish distribution. Essentially, indices attempt to account for fish lost from sampling to spill. Without spill, the collection and index numbers would be the same. Indices are also helpful in setting daily sample rates. (ex. % Flow through powerhouse, P = .8, Index, I = C/P, I = 1000/.8 = 1250)

As stated in the FPC annual reports, Fish Passage Indices (FPI) are used as relative indicators of population abundance, and assume that fish pass through spill and powerhouse units in numbers proportional to the flow through those passage routes. Indices are not estimates of total daily passage, but rather a relative measure of how the migration is progressing over the season for a given species.

The following table is used to approximate the correct sample rate for a given level of fish passage.

Table 1. Sample rate reference table for John Day and Bonneville dams.

Estimated Daily Collection	Sample Rate	Equivalent Multiplier 1/sample rate	Sample Sec/ hour	Subsamples per hour	Subsample Duration in seconds	Estimated number of fish in Sample
Emergency	0.50%	200	18	2	9	
> 75,000	0.70%	143	25.2	2	12.6	> 525
50,000 - 75,000	1.00%	100	36	2	18	500 - 750
35,000 - 50,000	1.50%	66.6	54	4	13.5	525 - 750
25,000 - 35,000	2.00%	50	72	6	12	500 - 750
16,500 - 25,000	3.00%	33.3	108	6	18	495 - 750
12,500 - 16,500	4.00%	25	144	6	24	500 - 660
10,000 - 12,500	5.00%	20	180	6	30	500 -625
7,500 - 10,000	7.00%	14.3	252	6	42	525 - 700
5,000 - 7,500	10.00%	10	360	6	60	500 - 750
4,000 - 5,000	12.50%	8	450	6	75	500 - 625
3,000 - 4,000	15.00%	6.66	540	6	90	450 - 600
2,500 - 3,000	20.00%	5	720	6	120	500 - 600
1,500 - 2,500	25.00%	4	900	6	150	375 - 625
500 - 1,500	50.00%	2	1800	6	300	250 - 750
< 500	100.00%	1	3600	1	3600	< 500

RESULTS AND DISCUSSIONS

JOHN DAY DAM

In 2003, the sixth year of sampling in the Smolt Monitoring Facility (SMF) at John Day, sampling commenced on 31 March and ended on 15 September. See Table A-1 and Table A-2 for a summary of all years of sampling at the SMF, including sample dates, sampling effort, and sample, collection, and index numbers.

The Numbers

Sample Numbers

The total number of fish handled at John Day in 2003 was 166,209 (Table 2), about 64% of the 2002 total of 257,741. Different research fish collection requests are responsible for some of the decrease, but other factors, such as spill levels and river flow play a large and difficult to quantify role. The average sample rate in 2003 was 8.5%, slightly less than the 9.0% in 2002. Approximately 55% of all fish sampled in the spring (April-May) were handled for SMP data purposes and 45% (n = 21,146) were caught as part of the increased sampling effort to accommodate USGS research requests. The proportion of the sample caught and handled for USGS in June and July was more significant at 80% (n = 74,251).

Species specific sample numbers expressed as a percent of 2002 sample numbers are as follows: sockeye, 27%; coho, 38.2%; unclipped steelhead, 44.5%; clipped steelhead, 46%; yearling chinook, 50.9%; and subyearling chinook, 85.5%. See Table A-1 for a comparison to previous years at the SMF.

The species composition, expressed as a percent of all the fish sampled, was lower this year than last year for yearling chinook, 21.7% versus 27.5%; sockeye, 4.7% versus 11.2%; clipped steelhead, 3.0% versus 4.2%; unclipped steelhead, 2.6% versus 3.8%; and coho, 2.1% versus 3.6%. Species composition for subyearling chinook was higher this year than last year, 65.8% versus 49.7%.

Collection Estimates

The total collection estimate of 4,742,123 is about 93.6% of the 2002 collection estimate of 5,067,733, however, not all species showed an increase in their collection estimates. Collection estimates expressed as a percent of last year's estimates are as follows: clipped steelhead, 120%; yearling chinook, 106%; unclipped steelhead, 98%; coho, 95%; subyearling chinook, 86%; and sockeye, 84%.

Fish Passage Indices

The 2003 FPI for all species combined was 6,326,556, about 85.9% of the 2002 FPI of 7,365,812. A breakdown by species for sample, collection, and index numbers can be found in Table 2 and a comparison of 2003 numbers to all previous years of sampling at the SMF can be found in Table A-1. For more information on index estimates see the FPC annual report.

Fry Incidence

The number of chinook fry ($\leq$ 60mm) sampled this season was 118, which generated a collection estimate of 1,343. This is 27% of the fry collection estimate for 2002 (4,979). Most of the fry were sampled in April (88%). Only 3% were sampled in May with June contributing 8% and July 1%. See Table A-1 for a summary of chinook fry collection estimates since 1998, and Table A-2 for 1985-1997 estimates.

Table 2. Summary of 2003 smolt monitoring at John Day and Bonneville dams.

Site	Species	Sample Number	Sample Percent Comp.	Collection[1] Number	Collection[1] Percent Comp.	FPI[2]	Descaling[3] #	Descaling[3] %	Mortality[4] #	Mortality[4] %
John Day	Yearling Chinook	36,096	21.7	1,557,882	32.9	2,074,699	1,643	4.6	108	0.3
	Subyearling Chinook	109,404	65.8	2,020,393	42.6	2,713,873	993	0.9	228	0.2
	Unclipped Steelhead	4,373	2.6	167,807	3.5	218,855	142	3.3	13	0.3
	Clipped Steelhead	4,983	3.0	253,047	5.3	334,668	432	8.7	15	0.3
	Coho	3,532	2.1	195,591	4.1	258,281	92	2.6	14	0.4
	Unclipped Sockeye	7,709	4.6	542,224	11.4	719,251	298	3.9	41	0.5
	Clipped Sockeye	112	0.1	5,179	0.1	6,928	9	8.0	0	0.0
	SEASON TOTALS	**166,209**		**4,742,123**		**6,326,556**	**3,609**	**2.2**	**419**	**0.3**
Bonneville PH #2	Yearling Chinook	20,927	26.1	1,616,876	22.8	4,043,774	577	2.8	65	0.3
	Subyearling Chinook	40,106	49.9	3,475,167	49.0	7,900,805	359	0.9	136	0.3
	Unclipped Steelhead	2,655	3.3	207,685	2.9	518,389	77	2.9	3	0.1
	Clipped Steelhead	4,512	5.6	446,715	6.3	1,116,776	340	7.6	10	0.2
	Coho	8,755	10.9	861,261	12.1	2,116,458	123	1.4	21	0.2
	Unclipped Sockeye	3,292	4.1	480,619	6.8	1,244,761	179	5.5	66	2.0
	Clipped Sockeye	56	0.1	6,562	0.1	16,607	1	1.8	0	0.0
	SEASON TOTALS	**80,303**		**7,094,885**		**16,957,572**	**1,656**	**2.1**	**301**	**0.4**
Bonneville PH #1	Yearling Chinook	2,156	38.9				166	7.7	8	0.4
	Subyearling Chinook	2,062	37.2				54	2.6	17	0.8
	Unclipped Steelhead	161	2.9				7	4.3	0	0.0
	Clipped Steelhead	268	4.8				20	7.5	1	0.4
	Coho	429	7.7				12	2.8	7	1.6
	Unclipped Sockeye	461	8.3				82	17.9	2	0.4
	Clipped Sockeye	5	0.1				0	0.0	0	0.0
	SEASON TOTALS	**5,542**					**341**	**6.2**	**35**	**0.6**

[1] Collection numbers are sample numbers divided by sample rate.
[2] FPI (Fish Passage Index) is collection divided by the proportion of daily average river flow through the powerhouse.
[3] Descaling numbers are based on sample numbers minus mortality numbers.
[4] Mortality numbers are based on sample numbers.

River Conditions

River Flow

This year, river flow was slightly lower than the historical averages for every month. The 2003 spring (April through May) river flow averaged 216.4 kcfs, 104.6% of the 209.6 kcfs for the same period last year. The spring peak flow for this period was a month and a half later this year, peaking at 347.5 kcfs on 31 May compared to 351.5 kcfs on 17 April last year. For the summer migration period, June and July, the average river flow declined significantly to 194.0 kcfs, about 85 kcfs less than the 278.3 kcfs for the same period last year. Flows continued to decline through August and September averaging 111 kcfs, comparable to last year's average for this period of 131.4 kcfs (Figure 2).

Spill and Dissolved Gas

The Fish Passage Plan (FPP) calls for spill to be 60% of river flow from 10 April to 31 August when total river flow is less than 300 kcfs, excluding special conditions for research. This year, spill during that period averaged just 23% of total river flow, less than last year's 30% average.

Total dissolved gas supersaturation, as measured in the SMF, averaged 103.8% for the season with a range of

101.8% to 105.3%. For more detail on dissolved gas levels and monitoring results, see the FPC annual report.

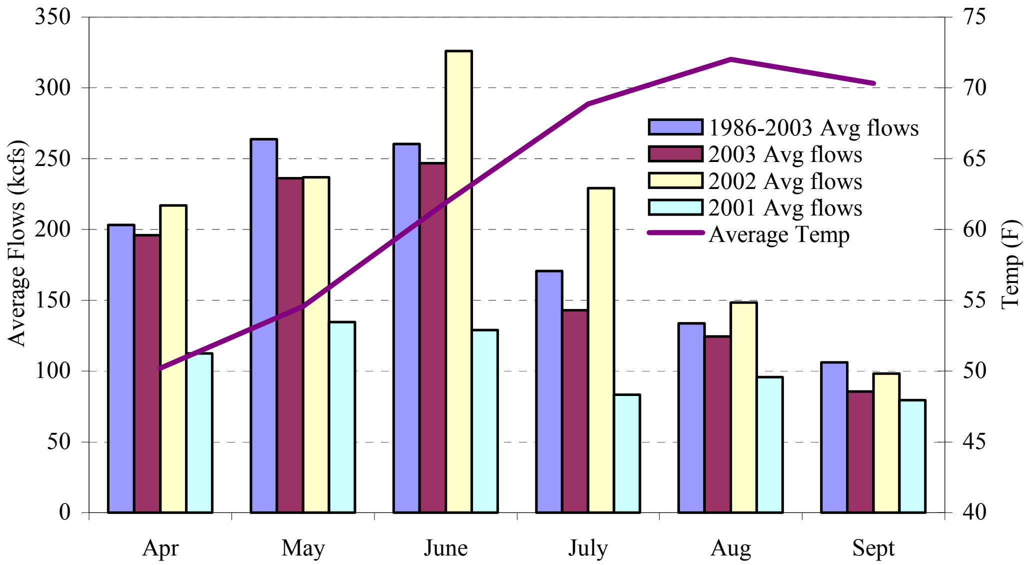


Figure 2. Average monthly flows for 2003, 2002, 2001, the historical average, and the average monthy temperature at John Day Dam.

Temperature
Spring water temperature in the SMF ranged from 47.3^0F to 58.9^0F and averaged 52.4^0F, which was 2.8^0F warmer than last year's average of 49.6^0F for the same period. During June and July the range was 58^0F to 73.3^0F with an average of 65.4^0F, which was 2.2^0F warmer than the same period last year. In August and September, the range was 68.2^0F to 73.3^0F, with an average of 71.5^0F, which was 2.2^0F warmer than the same period last year. The highest daily average temperature of the year (73.3^0F) was recorded on 5 August.

Passage Patterns
This year river flows were lower than last year, as was spill as a percent of total river, but the later timing of the peak flow this year (end of May instead of mid April last year) seems to have been more timely in aiding juvenile out-migration. All spring species passed John Day more quickly than last year despite reaching their 10% date later (Figure 3).

Yearling chinook passage reached the 10% date two days later than last year and reached the 90% date one day later than last year, so the middle 80% duration was nearly identical, 31 days versus 32 days last year. The 10%, 50%, and 90% dates are also very similar to the median dates so the yearling chinook passage pattern was typical, (Figure 4, Figure A-2, Table A-3). Yearling chinook passage occurred primarily in May again this year. Daily percent of total passage fluctuated between 3% and 6% in May; with the peak day occurring about three weeks prior to peak flows (Figure 4).

Subyearling chinook passage, after the second shortest migration last year, returned to a migration pattern similar to the median pattern. The 10% passage date was two weeks earlier and the 90% date was 10 days later than last year, resulting in a middle 80% duration of 55 days. This is 10 days shorter than the median and 24 days longer than last year's 31 days (Figure 3, Table A-3). This year did set a new record for the earliest 50% passage date. The reason was a 10% passage peak on 27 June that was three times larger than the next biggest day (Figure 4, Figure A-1, Table A-3).

Unclipped steelhead reached the 10% passage date later and the 90% passage date earlier for a reduction in the middle 80% duration of 15 days, from a record setting duration of 51 days last year to 36 days this year (Figure 3, Table A-3). The unclipped steelhead passage was less than 3% per day throughout May until flows increased on 28

May, which was followed by a six fold increase in passage, peaking at 17.9% of total on 31 May. The delay of significant passage numbers (Figure A-1) generated the latest 50% passage date ever recorded of 28 May but was so large that the 90% passage date was reached just one week later and was still close to the median date (Table A-3, Figure A-1).

Clipped steelhead passage was nearly identical to unclipped steelhead passage again this year (Figure 4). The 10% passage date was later than last year but the same as the median 10% date. The 50% passage date was the latest ever recorded and was only one day later than the 50% date for unclipped steelhead. These were followed closely by the 90% date, keeping the overall duration very close to the median (Figure 3, Figure A-2, and Table A-3). Compared to the historical pattern, the beginning and end of the run was similar in magnitude and timing to previous years, but the peak passage was later and more concentrated than usual (Figure A-1).

Coho reached the 10% passage date later and the 90% passage date earlier than last year, reducing the middle 80% duration from 37 days last year to 31 days this year. As with the steelhead, the 50% passage date was late in the migration but followed closely by the 90% date, keeping the overall duration similar to the median pattern (Figure 3, Figure A-2, Table A-3). Coho exhibited a dramatic increase in passage at the same time as the steelhead and concurrent with increasing flows (Figure 4). When compared to the historical passage pattern, this year's late season peak is very evident as is the similarity to the steelhead passage (Figure A-1).

Sockeye passage was similar to last year and the historical median, varying at most by two days on the 50% passage date (Figure 3). This produced a middle 80% duration just one day shorter than last year and the same as the historical median (Table A-3). Peak sockeye passage occurred on 18 May, consistent with previous years, about two weeks prior to peak river flow, and was just over 13% of total passage (Figure 4, Figure A-1).

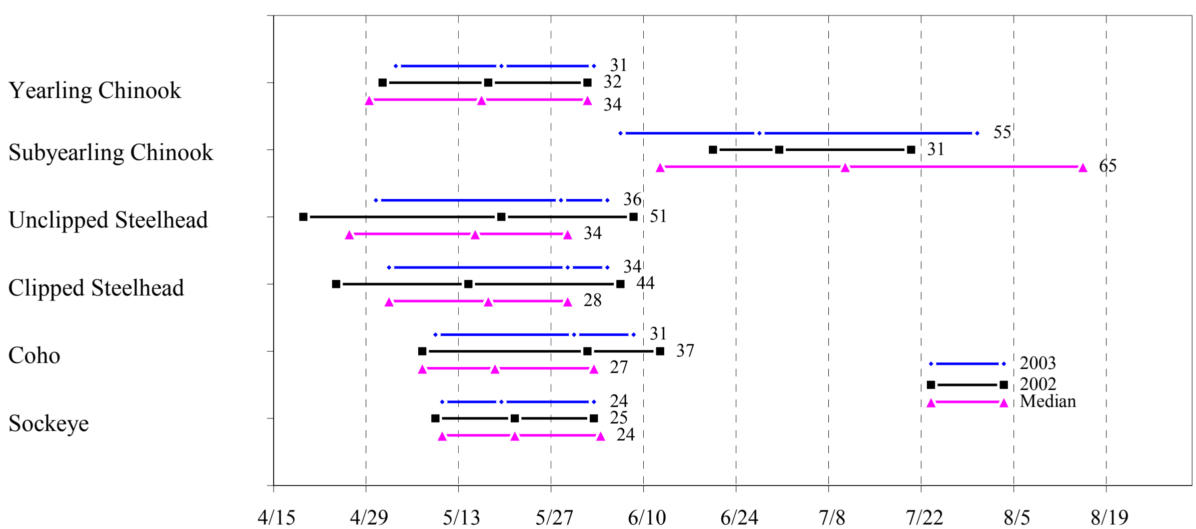


Figure 3. 10%, 50%, and 90% passage dates at John Day for 2003, 2002, and the historical median. The duration (in days) between the 10% and 90% passage dates is indicated for each line.

Figure 4. Seasonal passage patterns and daily average river flows for John Day, 2003.

Diel
With the relocation of sampling to the SMF in 1998, the collection of the hourly passage detail was discontinued. However, the diel data collected between 1985 and 1997 is presented several ways in Appendix A. Table A-13 presents the total percent of night passage by species for each year. Figure A-10 is a graphical presentation of the diel pattern for all years, averaged and presented with standard deviation for each hour. Figure A-11 shows the percent of night passage as a bar graph for each year and species, with the average for each species shown as a line. Table A-12 shows the detail for each hour, for all years of sampling, by species.

__Fish Condition__
Overall, descaling at John Day was low for all species with only slight variations from 2002 , the largest being a 4% decrease for sockeye (Figure 5). Mortality was similar to previous years and lower than the historical average for all species. Sockeye again had the greatest improvement with a decrease of 1.5 percent. Flows were down slightly from last year and the moderate debris load did not create any serious passage obstructions.

Yearling chinook descaling was 4.6%, a 1.5% increase from last year's 3.1%, but only 0.4% higher than the full bypass average of 4.2% (Figure 5, Table A-4). Descaling increased gradually throughout the migration, going over 8% on two days in late May. The descaling rate for yearling chinook peaked on 26 May at 10.5% (Figure A-3). Mortality for yearling chinook was 0.3%, lower than last year and the post-airlift average of 0.4% (Figure 6).

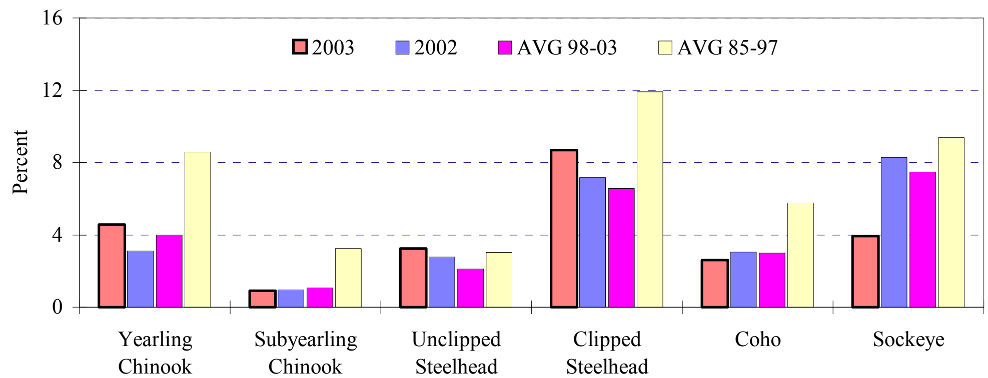


Figure 5. Total descaling for 2003, compared to 2002, the 98-03 average (full bypass), and the 85-97 average (single gatewell airlift sampling, Figure A-14) at John Day.

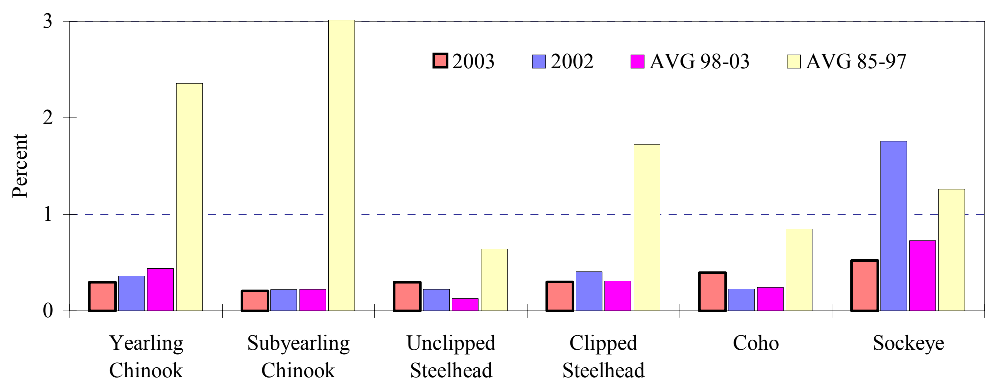


Figure 6. Total mortality for 2003, compared to 2002, the 98-03 average (full bypass), and the 85-97 average (single gatewell airlift sampling, Figure A-14) at John Day.

Subyearling chinook descaling at 0.9% was similar to last year (1%) and the same as the post-airlift average (Figure 5, Table A-4). Daily descaling was highest during late May and early June and also towards the end of the migration in August and September. Descaling exceeded 4% on a few days in August but generally stayed well below 4% throughout the migration (Figure A-3). Mortality for subyearling chinook (0.2%) was the same as in 2002. The daily fluctuation in mortality was similar to the pattern seen for descaling, slightly higher at the beginning and end of the season (Figure A-3).

Unclipped steelhead descaling (3.3%) was up from last year's rate (2.8%) and the highest rate observed since sampling relocated to the SMF in 1998 (Figure 5). Descaling was slightly higher than the average from the airlift sampling years (3%) which is unusual. Part of the reason for this is the higher than normal rate of bird predation marks this year (5.4%) which contributes to descaling (Table A-5, Figure A-4, Table A-4). Another reason may be that in the last few years the number of non-clipped hatchery steelhead has increased and those fish are recorded as unclipped fish. Hatchery fish consistently have higher rates of descaling and predation marks, which would influence true wild fish condition percentages. The highest rates of descaling for unclipped steelhead were seen in late May and early June when descaling exceeded 9% four times (Figure A-3). Mortality was also higher this year compared to the last several years but still very low at 0.3% (Figure 6, Table A-4, Figure A-5). Most of the mortality occurred near the end of the migration and coincided with higher descaling (Figure A-3).

Clipped steelhead descaling increased for the second consecutive year to 8.7%. This is an increase from last year's 7.2% and 2.5% higher than the post-airlift sampling average of 6.2% (Figure 5, Table A-4). Again, as with the other species, descaling has declined since abandoning the airlift system, going from an average of 11.9% prior to 1998, to 6.2% since (Figure A-5, Table A-4). Clipped steelhead descaling was mostly below 12% through the end of May, until it reached as high as 15.2% the first week of June. Mortality was down from last year at 0.3%, which is 1.4% lower than for airlift sampling years at 1.7% (Figure 6, Figure A-5, Table A-4).

Coho descaling was 2.6% for the season, nearly the same as the post-airlift average of 2.5% and 0.5% lower than in 2002 (Figure 5, Figure A-4, Table A-4). In general, daily coho descaling increased as the migration progressed but large fluctuations were common (Figure A-3). Descaling peaked at 11% on 4 June. Mortality for coho has not exceeded 0.4% since sampling relocated to the SMF and this year was no exception at 0.4% (Figure 6, Figure A-5, and Table A-4).

Sockeye descaling decreased from 8.3% last year to 3.9% this year (Figure 5). This is less than half the 1985-1997 average of 9.8% and 3.2% less than the post-airlift average of 7.1% (Figure A-4, Table A-4). Daily descaling fluctuated around 4% until 23 May when it increased to 9.9% with three other spikes above 7% prior to 8 June (Figure A-3). Mortality decreased to 0.5% this year, less than half the post-airlift average of 1.1% (Figure 6, Figure A-5, and Table A-4).

Subsampled Fish Condition

In 2003, 26,579 smolts were examined for detailed condition information. Condition data were collected on yearling chinook from 1 April to 6 June, steelhead from 1 April to 11 June, coho from 3 April to 6 June, sockeye from 4 April to 11 June, and subyearling chinook from 8 June to 15 September.

Partial descaling (3-19% on one side) decreased for subyearling chinook, from 4.7% last year to 4.4% this year. Decreases were also noted for sockeye, 12% last year to 9.3% this year. Increases in partial descaling were observed on yearling chinook, 6.1% to 7.8%, unclipped steelhead, 6.4% to 8.7%, clipped steelhead, 11.1% to 16.7%, and coho, 6.7% to 7.4%. Clipped steelhead had the highest incidence of opercular damage at 2.1%, which is 0.5% higher than last year but still 2.3% lower than the historical airlift sampling percent of 4.4%. Again, as in past years, the incidence of attempted bird predation was much higher on clipped steelhead (9.2%) than any other species (0.1% - 5.4%). Bite marks, believed to be from other fish (walleye, northern pike minnow, bass) increased for yearling chinook (0.3% to 1.2%), coho (0.3% to 1.2%), unclipped steelhead (0.2% to 0.6%), and clipped steelhead (0.3% to 1%). Decreases in fungus were observed on all species (0.1% to 4.3%), except for subyearling chinook, 0.0% to 0.1%, and unclipped steelhead, 1.3% to 2%. The frequency of head injuries was 0.1% to 0.5% lower for all species, with clipped steelhead showing the highest incidence at 1.2%. The incidence of parasites for unclipped steelhead increased from 5.3% to 8.4%, and yearling chinook went from 1.7% last year to 2.4% this year. Parasites decreased on clipped steelhead from 5.5% to 1.5%. Body injuries increased on yearling chinook, 1% to 1.7%, unclipped steelhead, 1.2% to 1.9%, and subyearling chinook, 1.1% to 1.4%. See Methods section for a complete list of possible conditions and techniques. For a historical summary of condition subsampling results, see Table A-5.

Length Averages

Since high percentages of out-migrating smolts are of hatchery origin, length data are primarily a function of smolt size at the time of release. However, graphing the data does show some relative size differences and trends throughout the season. Clipped steelhead were consistently the largest fish sampled until 11 June, when subsampling for clipped steelhead stopped. Subyearling chinook increased in size as the season progressed and all other species varied (Figure 7).

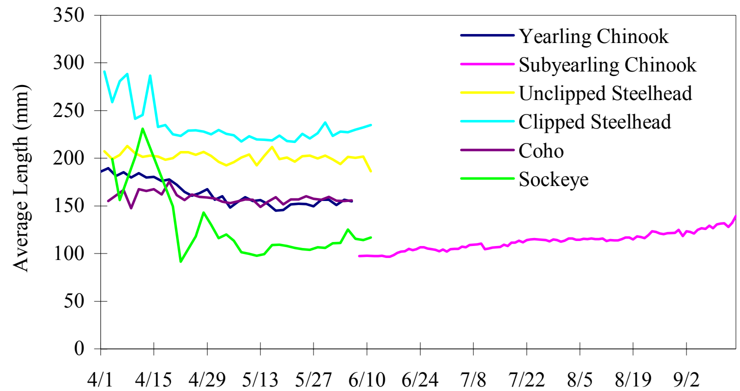


Figure 7. Average lengths at John Day in 2003.

Gas Bubble Trauma (GBT) Monitoring

Sampling of juvenile salmonids for GBT was discontinued at John Day in 1999. For results from previous years, see the reports for those years or the FPC website (www.fpc.org).

Passive Integrated Transponder (PIT) Tags and External Marks

PIT Tags

Total PIT tag detections increased from 137,423 in 2002 to 198,667 in 2003, a 31% increase. Chinook (73.5%) and steelhead (25.1%) accounted for 98.6% of all detections while coho, sockeye, and unknown fish made up the remaining 1.4%. About 0.5% of the detections were from “holdovers”, or fish that were expected to migrate in 2000, 2001, and 2002. A summary for this year by species, run, rearing type, and expected migration year can be found in Table A-6. Refer to Table A-7 for a historical comparison of PIT tag detections at John Day.

Elastomer Tags

Elastomer tags are colored plastic that is injected into tissue posterior of the eye. A total of 2,770 elastomer tags were recorded this year, which is about 42% of the 6,623 observed in 2002 (Table A-9). Most of these tags (52%) were in yearling chinook (fall, spring, and unknown race) released in the Yakima, Snake, Wallowa, Tucannon, Touchet, Wenatchee, Grande Ronde, Clearwater, or Methow Rivers. The percentage of sampled fish with elastomer tags was 1.7%, down from 2.6% in 2002. Table A-8 contains more detail for these marks.

Freeze Brands

A total of 6 freeze brands were observed in 2003, down from 25 recorded last year. All brands were on hatchery summer steelhead and originated from the Grande Ronde River, Tucannon River, or the Snake River (Table A-8). For a summary of brands per year by species see Table A-9.

Performance Monitoring

Personnel

The quality control program at John Day utilized peer consensus, quality control tests, and digital cameras to photograph fish. Pictures could be discussed later and decisions reviewed. When all crewmembers were working, questionable fishes, marks, or conditions were discussed with fish in hand. Otherwise, pictures provided the ability to review and discuss specimens without delaying processing or prolonging exposure to the fish anesthetic. This technique was useful in checking species identification, fin clips, descaling, fish condition, and brand or tag recognition. This archive also allows off-site personnel and training groups to review species characteristics, which helps increase the accuracy and consistency of the data.

Equipment

A total of 4 hours and 20 minutes were defined as lost or biased sample time at John Day during the 2003 out-migration. This was due to a scheduled dewatering of the PDS on 27 June from 0840 – 1300. On 15 September, the bypass facility was dewatered for the season.

The screen cleaning system at the PDS was run manually once per shift during the 2003 season.

Adult Fallback Summary

The SMF is equipped with an adult sampling system, which was used for the third consecutive season by the CoE Fisheries Field Unit. In addition to this effort and to gauge the quantity of fish exiting the PDS, a hinged gate was installed in 1998 just downstream of the FDS bars, which tallied adults as they passed the gate. The adult fallback passage number was recorded by CoE biological technicians every other hour throughout the season. An elastic strap was installed on the upstream side of the tally gate and reduced the number of over and under counting situations and nearly eliminated any occurrence of the gate sticking in the up position. Approximately 35,242 fish were recorded from 31 March through 15 September. It was not possible to collect species detail so non-salmonids are included in the season total. See Table 3 for a summary of fallbacks since 1998.

Table 3. Unknown fallbacks tallied at John Day FDS, 1998-2003.

	1998	1999	2000	2001	2002	2003
Unknown Fallbacks	642	9,725	5,105	4,685	25,195	35,242

Initially, the concern over adults holding in the PDS came from the number of adult fish found during mid-season dewaterings (Table A-11). Eventually, this concern and the fact that such a small portion of the juvenile out-migration passes the project from mid-September through October (2-3%) led to the decision to shut down sampling in mid-September, which we did again this year.

Incidental Catch

American shad (*Alosa sapidissima*) were by far the most common incidental species captured at John Day in 2003. The first juvenile shad was sampled on 1 April and peaked with an estimated 313,200 fish passing through the bypass system on 7 August. Two smaller collection peaks were also observed on 10 August (248,412) and 17 August (253,767). From 24 July to 15 September, shad passage averaged 58,568 per day (Figure A-7). The total estimated collection number for 2003 is 3,163,054, about 58% of the 2002 total of 5,451,889 and approximately 488% of the 648,522 collected in 2001 (Figure A-8, Table A-10).

Another incidental species present in our samples in large numbers is the juvenile (or out-migrating) Pacific lamprey (*Lampetra tridentata).* Although out-migrating lamprey were found in our samples throughout the season, they did appear to have two distinct passage peaks in 2003. The first occurred on 30 May when an estimated 21,601 lamprey passed the project through the bypass system. The most noteworthy passage peak occurred over a three day period, from 7-9 June when an estimated 67,700 lamprey passed the project (Figure A-7). Approximately 98.7% of the juvenile lamprey were smolted (macropthalmia), while the remaining 1.3% were ammocoetes in various stages of metamorphosis. The total estimated lamprey collection for 2003 was 191,876, about 69% of last year's estimate of 279,302 (Figure A-8, Table A-10).

Research

During the season, John Day smolt monitoring personnel provided support to four research projects, listed below by agency. Support activities varied but focused on fish collection and enumeration, equipment set up, and handling. A significant portion of the effort put forth by the SMP crew involves tracking USGS request schedules, analyzing in-season migration trends for target species, noting percent spill schedules, and estimating the next day's sample rate. Great care was taken by SMP personnel to ensure that enough fish were present for USGS the next day without having an excess. In accordance with the NOAA Fisheries ESA permit, we constantly strive to minimize the impact of our sampling on the out-migration as a whole. Research fish were collected from the general sample which was elevated on 69 of 168 (41%) sample days to collect fish for researchers. Fish collected on those days were divided up between smolt monitoring and the research group for allocation to respective ESA permits. In the spring, the number of fish handled was much closer to the combined needs of smolt monitoring and research, resulting in lower by-catch. In the fall, size requirements resulted in handling of many fish that were too small to be tagged, increasing bycatch. Figure A-6 graphically presents this sample division and bycatch issue.

U.S. Geological Survey-Biological Resources Division

1. *Juvenile Salmon Survival Studies at John Day and The Dalles Dams, 2003.* Principle Investigator: Tim Counihan. The goal of this research was to use radio telemetry to generate juvenile salmonid survival estimates at John Day and The Dalles Dams, including total project survival and route specific survival. Fish were released at or near John Day Dam for generating estimates for both dams. A total of 6,738 yearling chinook salmon, and 9064 subyearling Chinook salmon were collected at the John Day SMF for this research.

2. *Estimate Fish Passage Efficiency (FPE), Spill Passage Efficiency (SPE), and Juvenile Bypass Efficiency (JBYPE) at John Day Dam, 2003.* Principal Investigators: John Beeman. The goal of this research was to use radio telemetry to generate FPE, SPE, and JBYPE estimates at John Day Dam, during two spill conditions (45% and 60%). Fish used to generate these estimates were released at Rock Creek, WA as part of the aforementioned survival studies.

3. *Tailrace Egress Following Juvenile Bypass System Passage at John Day Dam, 2003.* Principal Investigator: Theresa Liedtke. Radio telemetry was used to evaluate the tailrace egress of juvenile salmon following juvenile bypass system (JBS) passage at John Day Dam. Fish were released into the JBS flume during two spill conditions (45% and 60%), and their movements through the tailrace were intensively monitored with a combination of fixed-site receiving stations and boat tracking. The emphasis of this study was on gathering information about fish movements within the boat-restricted zone. A total of 200 yearling chinook salmon were collected for tagging in the spring, and 144 subyearling chinook salmon were collected in the summer at the John Day SMF for this research.

<u>Pacific Northwest National Laboratory (PNNL) -Battelle</u>

4. *Feasibility study to Evaluate the use of Dyes to Detect Injuries in Juvenile Pacific Lamprey (Lampetra tridentata).* Principal Investigators: Matthew Bleich, Russel Moursund. In 2003, PNNL evaluated the effects of experimental dyes which can be used to detect injuries in juvenile Pacific lamprey. Lamprey were placed individually in an experimental flume with an ESBS screen in order to document interactions and the type of injuries incurred. Photography was used to document interactions and the subsequent damage to fish. Following photography, fish were euthanized in a lethal solution of MS-222. Approximately 106 out migrating Pacific lamprey were collected in May for this research.

<u>BONNEVILLE DAM</u>

This was our fourth year of index level sampling at the JMF. Sampling began at 0700 hours on 11 March and concluded at 0700 on 31 October. Sampling in PH1 began on 8 April, ended on 31 July and consisted of condition monitoring (three/week), GBT exams (twice/week), and flat plate monitoring again this year. As with the previous two years, PH1 sampling ended early because there were no fish passing through the bypass system. The FPP stipulates that during the fish passage season (March – September), PH2 turbines should be operated before PH1 turbines. Further, from 10 April through August, some water is to be spilled for juvenile fish passage before the PH1 turbines are operated. In a low to average flow year, little water is left to operate PH1 turbines, as was the case for the last three years. Without turbine operation, there is insufficient flow to attract fish to PH1.

Table B-1 (PH2) and Table C-1 (PH1) are summaries of all years of sampling including sample dates, sampling effort, and sample, collection, and index numbers.

<u>The Numbers - Second Powerhouse</u>

Sample Numbers

The total number of fish sampled at the JMF was 80,303, about 94% of last year's total of 85,552. The species composition was as follows: subyearling chinook, 49.9%; yearling chinook, 26.1%; coho, 10.9%; clipped steelhead, 5.6%; sockeye, 4.2%; and unclipped steelhead, 3.3%. The average sample rate was 8%, down 2% from last year.

Collection Estimates

The collection estimate for PH2 was 7,094,885, about 115% of last year's collection estimate of 6,153,317. The species composition for the collection estimate can be different from the composition of the sample numbers due to the use of multiple sample rates and changing species composition throughout the day and season. Our estimate for species composition of the fish using the bypass system, is as follows: subyearling chinook, 49%; yearling chinook, 22.8%; coho, 12.1%; sockeye, 6.9%; clipped steelhead, 6.3%; and unclipped steelhead, 2.9%.

Fish Passage Indices

The 2003 FPI for all species combined was 16,957,572, about 113% of last year's 14,962,288 FPI. A breakdown by species for sample, collection, and index numbers can be found in Table 2 and a comparison of this year's numbers to the previous three years of sampling in the JMF can be found in Table B-1. For more information on index estimates see the FPC annual report.

Fry Incidence
At PH2 the number of chinook fry (≤ 60mm) sampled this season was 1,069, which expanded to a collection estimate of 17,978. This is about 30% of last year's collection estimate. Chinook fry passage occurred slightly earlier this year with 43% in March compared to 20.8% last year, and 55% in April compared to 63% last year. Only 1% were observed in May and June.

Coho fry passage was similar to previous years with 20 sampled and a collection estimate of 286. The majority (70%) of the coho fry were sampled in March compared to 21% last year.

See Figure 10 for a graphic summary of chinook fry passage and Table B-1 for a historical fry summary.

The Numbers-First Powerhouse
Starting in 2000, sampling in PH1 was reduced to three times per week for condition and GBT monitoring only. The total sample in 2003 was 5,542. This is 68.5% of last year's sample size. Declining river flow, powerhouse 2 priority, and spill combined to eliminate any flow for first powerhouse turbines. After 24 June, flow through PH1 was essentially zero and consequently the GBT monitoring was moved to the JMF. We continued to operate and monitor the flat plate through July but sampling for condition monitoring was terminated. No PIT tags were detected after 24 June. Species specific sample numbers for this year can be found in Table 2. Table C-1 presents sample numbers and other data for all years of sampling in PH1. Species composition was as follows: yearling chinook, 38.9%; subyearling chinook, 37.2%; sockeye, 8.4%; coho, 7.7%; clipped steelhead, 4.8%; and unclipped steelhead, 2.9% (Table 2). Collection and FPI numbers are not calculated from PH1 samples.

Fry Incidence
At PH1, 26 chinook and two coho fry (≤ 60mm) were sampled. These numbers are consistent with the low numbers seen in the last few years since sampling effort at PH1 was reduced. Prior to 2000, both species of fry were sampled in quantities similar to what we have sampled in PH2 since 2000 (Table B-1, Table C-1).

River Conditions
River Flow
River flows this year were similar to the historical average and to last year's flows. Spring river flow, March through May, averaged 217.1 kcfs or 103.5% of the 209.6 kcfs in 2002. The peak flow for this period was 325.7 kcfs on 29 May. This is about 92% of last year's high flow for this same period of 353.4 kcfs on 17 May. For June and July, river flow averaged 218.8 kcfs, about 78% of last year's average for the same period of 279.3 kcfs. The peak flow for this period was 358.4 kcfs on 2 June, compared to 374.9 kcfs on 6 June last year. Flows for August through October were similar to last year, averaging 118.9 kcfs compared to 123.2 kcfs last year. The peak flows for this period were also similar, 187.6 kcfs this year and 186.3 kcfs last year. For the period of March through October, PH1 discharge averaged 19.5 kcfs compared to an average of 23.3 kcfs last year.

Spill and Dissolved Gas
The FPP calls for spill of 75 kcfs from 10 April through 31 August during the day and more at night, up to the 120% total dissolved gas cap. This year, spill occurred from 10 April to 31 August and averaged 102.7 kcfs, or about 50% of river flow. For the same period last year, spill averaged 115.7 kcfs or 49.7% of river flow.

Shifting of flow to spill following a Spring Creek National Fish Hatchery (SCNFH) release increases the number of those fish passing the project via the spillway and is intended to improve survival. There were three SCNFH releases of tule fall chinook this year; the first was on 8 March and consisted of 7.6 million fish. Three days of spill for this release averaged 39.9 kcfs or 24.9% of total river flow per day. The second was on 14 April and consisted of about 4 million fish. Spill for this release averaged 127 kcfs or 56.7% of river over the 10 days following that release. The final release on 8 May included about 3.4 million fish. Spill averaged 128 kcfs or 55.6% of river for the 10 day period following the release (Table 4).

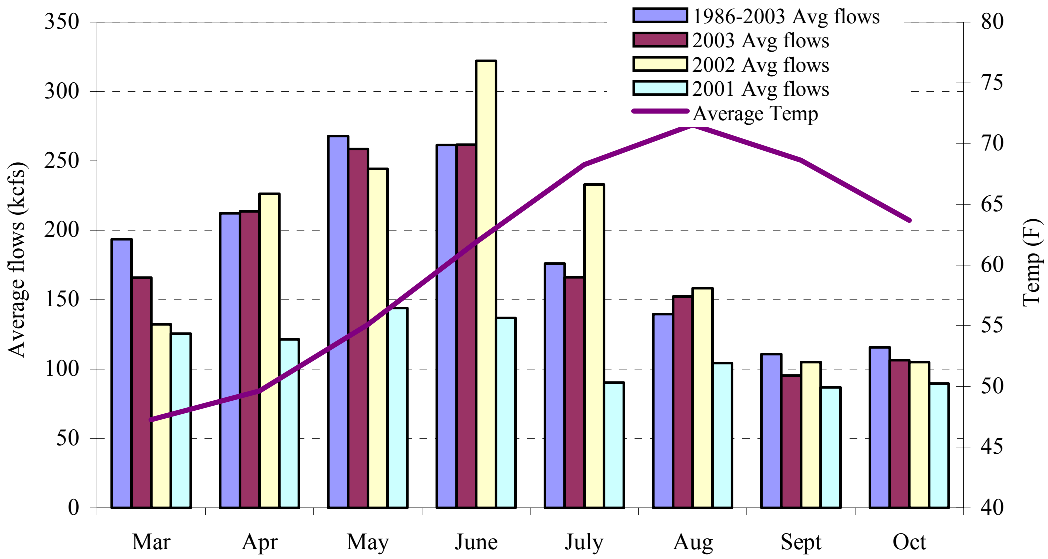


Figure 8. Average monthly flows for 2003, 2002, 2001, the historical average, and average monthly temperature at Bonneville Dam.

Table 4. 2002 Spring Creek National Fish Hatchery releases.

Release Date	Number (millions)	Peak PH2 Passage	Average Spill (kcfs)	Spill as % of River
March 8	7.6	11 March	39.9	24.9
April 14	4.1	16 April	127.0	56.7
May 8	3.4	11 May	128.0	55.6

Dissolved gas levels during the juvenile spill program period, 10 April to 31 August, measured at Warrendale, averaged 113.4%. This is below the Oregon and Washington Departments of Environmental Quality imposed gas cap of 120%. For the same period last year, gas supersaturation levels averaged 115.6%.

Passage Patterns

Passage timing and migration duration summaries use FPI's which for the last four years were calculated using PH2 samples. For the first three years of sampling in the JMF we used the historical median passage patterns from PH1 sampling (1987-1999). This year the median pattern was generated from the four years of sampling in the JMF.

Yearling chinook passage timing was very similar to the last three years and the historical median with the middle 80% duration varying by only four days, from 38 to 42 (Figure 9, Table C-2, Figure B-2). An increase in passage correlated with the onset of spill on 10 April and generally stayed at or above 2% of total passage for the next six weeks until the first of June (Figure 10). Yearling chinook passage reached the 90% passage date on 31 May, about the time the spring freshet was peaking. The biggest single day passage of about 4% of total occurred on 18 May (Figure 10, Figure B-2).

Subyearling chinook passage is a combination of SCNFH releases of tule stock, all occurring prior to June, upriver bright stock, passing the project after 1 June, and fry (Figure 10). The tule hatchery releases are obvious passage peaks occurring a day or two after the release dates listed in Table 4. Since this hatchery is only 21 miles upstream from Bonneville and the releases are large they pass in large groups often requiring that we minimize the sample rate or sometimes stop sampling completely (Figure 10, Figure B-2).

The passage timing and duration of the middle 80% listed in tables and shown in figures is for the upriver bright stock, passing Bonneville after 1 June. The upriver bright migration reached the 10% passage date about a week earlier than last year's record setting late date (21 June) and the 90% passage date a few days ahead of last year's date for a middle 80% duration of 35 days (Figure 9, Table B-2). Upriver bright passage peaked at about 5% of total passage on 30 June with declining river flows but stable spill (Figure 10). Peak passage for subyearlings has been consistent for the last four years (Figure B-2). Chinook fry passage peaked in mid-April just after a SCNFH release and it is likely that many of the fry were small SCNFH fish. Fry were present in our samples until mid-June (Figure 10).

Unclipped steelhead percent passage dates have varied little the last four years, with a middle 80% duration range of 38 to 40 days (Figure 9, Table B-2). Peak passage was about 7% of total at the end of June and coincided with peak river flow (Figure 10). This is consistent with previous passage patterns (Figure B-2).

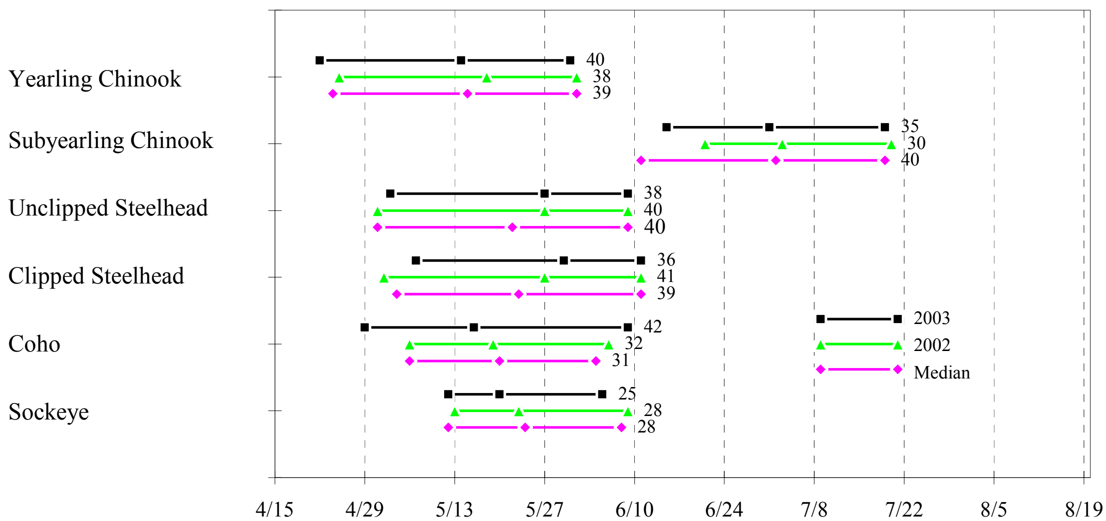


Figure 9. 10%, 50%, and 90% passage dates for 2003, 2002, and the median, 2000-2003. The duration in days between the 10% and 90% passage dates is indicated.

Clipped steelhead passage continues to be similar to the unclipped steelhead passage. The 10%, 50%, and 90% passage dates are within a few days of each other, consequently the number of days for the middle 80% to pass Bonneville is different by only two days (Figure 9, Table B-2). The daily passage pattern is also similar with passage increasing on 22 April and climbing to a peak of about 7% of total on 1 June. Both clipped and unclipped steelhead experienced a second smaller peak on 9 June before tapering off for the season (Figure 10). This pattern is similar to what we have seen the last three years.

Coho passage reached the 10% and 50% passage dates earlier and the 90% passage date later than any prior year of sampling in the JMF. This resulted in the longest middle 80% duration (42 days) since sampling began at the JMF (Figure 9, Figure B-1, and Table B-2). Passage peaked at 4% on 7 May, before peak river flows and three weeks ahead of the peak period observed in the last three years (Figure 10, Figure B-2).

Sockeye passage reached the 50% and 90% passage dates earlier than previous years due to a single large passage peak on 19 May of about 15% (Figure 10). Enough sockeye were present in our samples on both sides of the peak passage day to generate a middle 80% duration (25 days) similar to last year (28 days) and the median (28 days) (Figure 9, Table B-2). Peak sockeye passage has varied over the years but this single day peak is one of the largest ever seen.

Diel

Diel passage summaries are based on four years (1992-1995) of diel sampling from PH1 which showed that passage of all species increased starting at 2000 hours and peaked at 2200 hours. The average percent of total passage occurring at night (1800 - 0600 hours) ranges from 54.7% for yearling chinook to 70.8% for coho. For more detail on diel passage see Figure C-6, Figure C-7, Table C-8, and Table C-9.

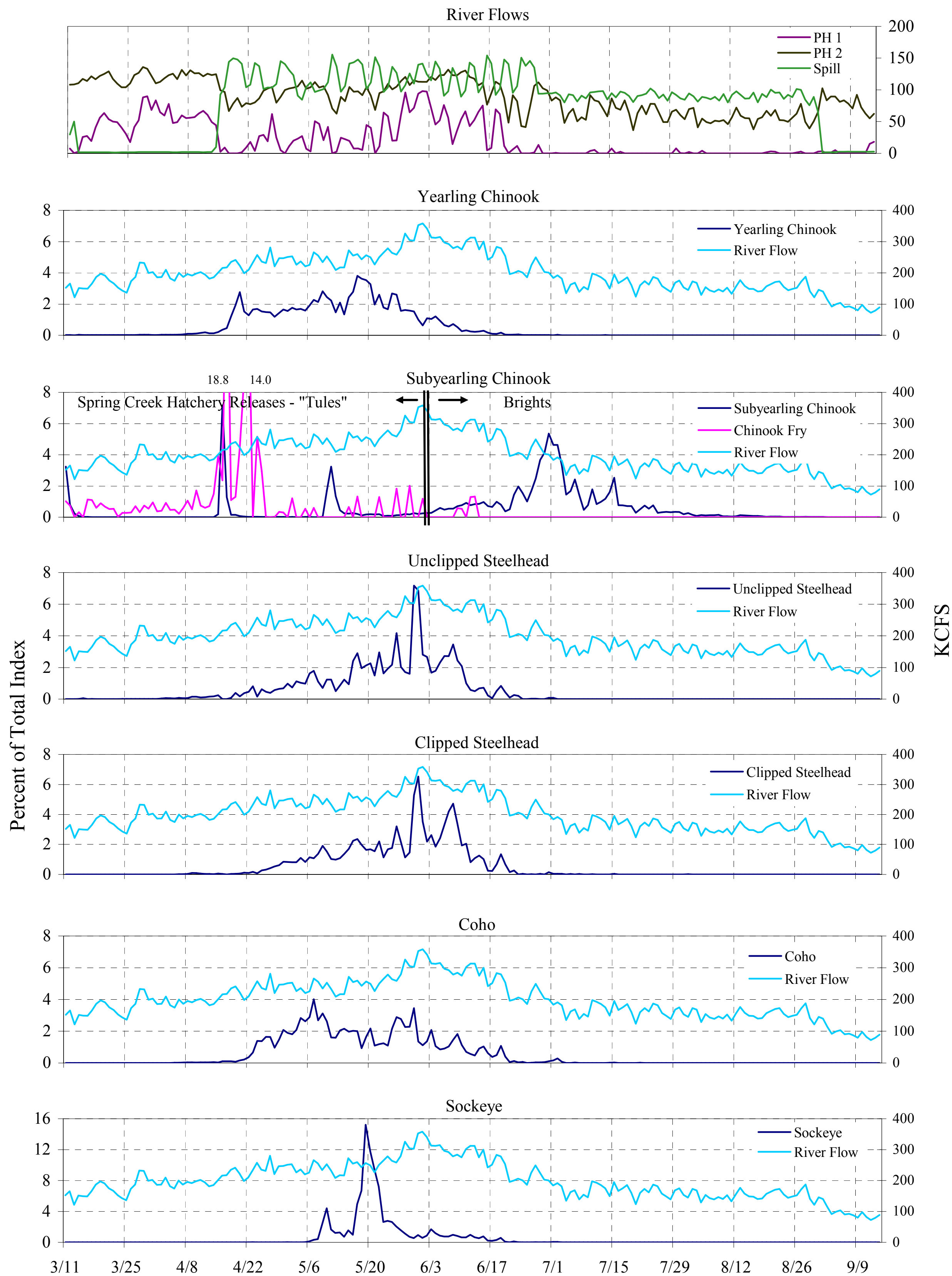


Figure 10. Seasonal passage patterns and daily average river flows at Bonneville PH2, 2003. Note scale difference for Sockeye.

Fish Condition

Powerhouse 2 - Descaling

Descaling levels from the second powerhouse were similar to last year for all species. One of the main contributors to descaling is debris which is difficult to quantify but is usually greater in higher flow years. Please note that the historical average is from the old sampling system in the north end of PH2, referred to as the Fingerling Experimental Research Lab (FERL). In 2000, use of the new dewatering system in the powerhouse, and use of the new JMF began. The descaling and condition data recorded since that transition, being consistently lower, suggests that the new system causes less descaling and mortality (Figure 11, Figure 12).

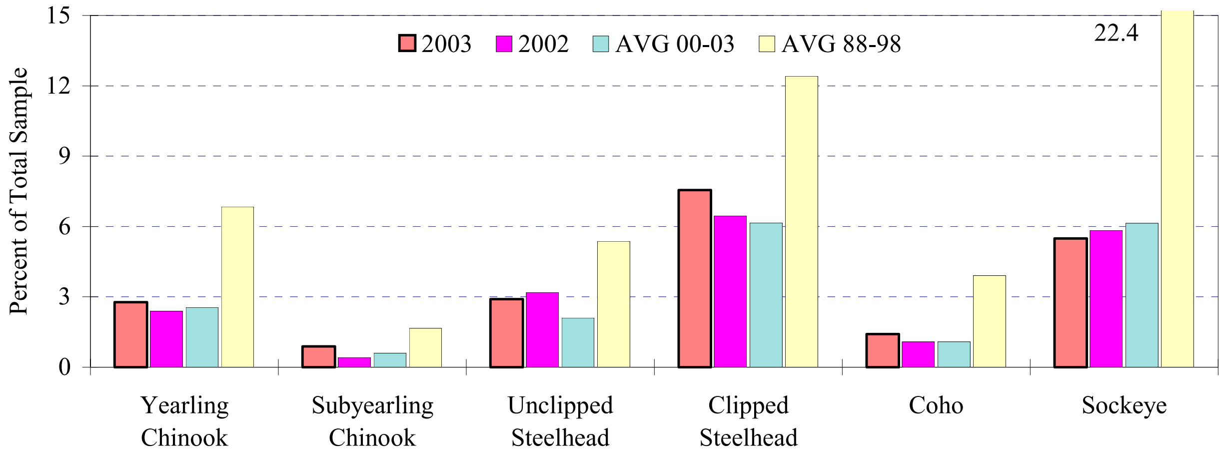


Figure 11. Total descaling for 2003 at PH2 compared to 2002, the 00-03 average from the JMF, and the 88-98 average from the FERL at Bonneville, PH2.

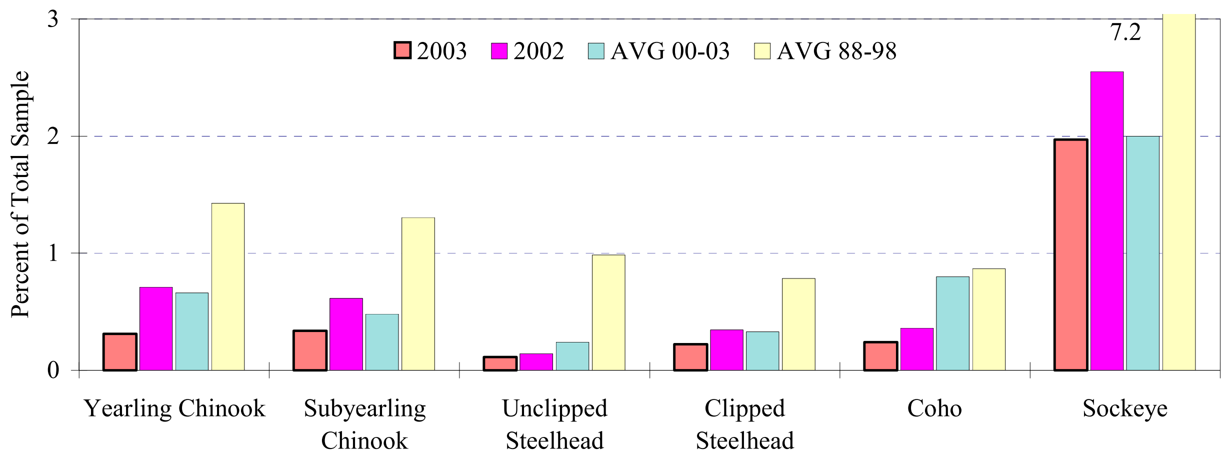


Figure 12. Total mortality for 2003 at PH2, compared to 2002, the 00-03 average from the JMF, and the 88-98 average from the FERL at Bonneville, PH2.

Yearling chinook descaling was up from 2.4% last year to 2.8% this year (Figure 11, Table B-3, Figure B-4). Descaling averaged 2.6% for the four years at the JMF, which is significantly lower than the 6.8% rate recorded between 1988 and 1998 when sampling was conducted in the FERL in PH2. Daily rates were relatively high for the first few days of the season, around 9%, before dropping to around 3% throughout April. Descaling increased in May and peaked in late May, near the end of the run. Mortality fell to 0.3% this year from 0.7% last year (Figure 12, Table B-3, Figure B-5).

Subyearling chinook traditionally have the lowest descaling, and this year was no exception at 0.9%, more than double last years 0.4 % rate, but still quite low (Figure 11, Figure B-4, Table B-3). The average at the JMF (0.6%)

is about a third of the average for the eleven years (1.7%) of sampling in the FERL (Table B-3). Daily descaling stayed below 3% throughout July but had several days of about 5% and three days above 10% in August (Figure B-3). Mortality was also low at 0.3% for the season, down by half from last year's 0.6%. This is slightly lower than the four year average of 0.5% and about one third of the 1.7% average generated over the eleven years of sampling in the FERL (Figure 12, Figure B-5, and Table B-3).

Unclipped steelhead descaling was down from 3.2% last year to 2.9% this year (Figure 11, Figure B-3, Figure B-4). The average for the last four years was 2.1%, considerably lower than the 5.3% average for the 1988 to 1998 period. Daily rates varied throughout the migration period with several peaks, the highest on 9 June at about 14%. Mortality for the season was the same as last year, a very low 0.1% (Table B-3, Figure B-3).

Clipped steelhead descaling was the highest of any species at 7.5%, up from 6.5% last year and higher than the four year average of 6.2% but lower than the average for the old system of 12.4% (Figure 11, Table B-3). Daily descaling was highest towards the end of the migration and peaked at about 25% on 22 June (Figure B-3). Mortality was very low at 0.2%, slightly lower than the four year JMF average of 0.3% (Figure 12).

Coho descaling increased from 1.1% last year to 1.4% this year (Figure 11, Table B-3). Coho descaling is typically low, averaging 3.9% for the 1988 to 1998 period, and just 1.1% for the last four years. Coho descaling was highest early in the migration peaking at 12% on 14 April. For most of May, descaling was below 3%, but in June, descaling was routinely between 4% – 5% (Figure B-3). Mortality for coho declined from 0.4% last year to 0.2% this year. Coho mortality for the 1988 – 1998 period averaged 0.9% (Table B-3, Figure B-5).

Sockeye descaling has shown the most improvement since sampling relocated to the new facility. This year sockeye descaling was 5.5%, lower than last year and the four year average from the JMF. The average for the 10 year period of sampling in the FERL is four times as high at 22.4%. There were a few days of high descaling this year, peaking at 15% on 27 June (Figure 11, Table B-3, Figure B-5, Figure B-3). Sockeye mortality was 2% for the year, equal to the four year average and lower than last year and a considerable improvement over the rate observed in the FERL of 7.2% (Figure 12, Figure B-5, Table B-3).

Powerhouse 1 – Descaling

Descaling and mortality values are based on a sample size of 5,542. Descaling in 2003 was lower than last year for all species except coho (Figure 13, Table C-3, and Figure C-3). The largest decline was for sockeye, dropping by half, from 35.3% last year to 17.7% this year. Clipped and unclipped steelhead also had significant reductions while yearling and subyearling chinook were similar to last year and coho descaling was up slightly (Figure 13, Table C-3)

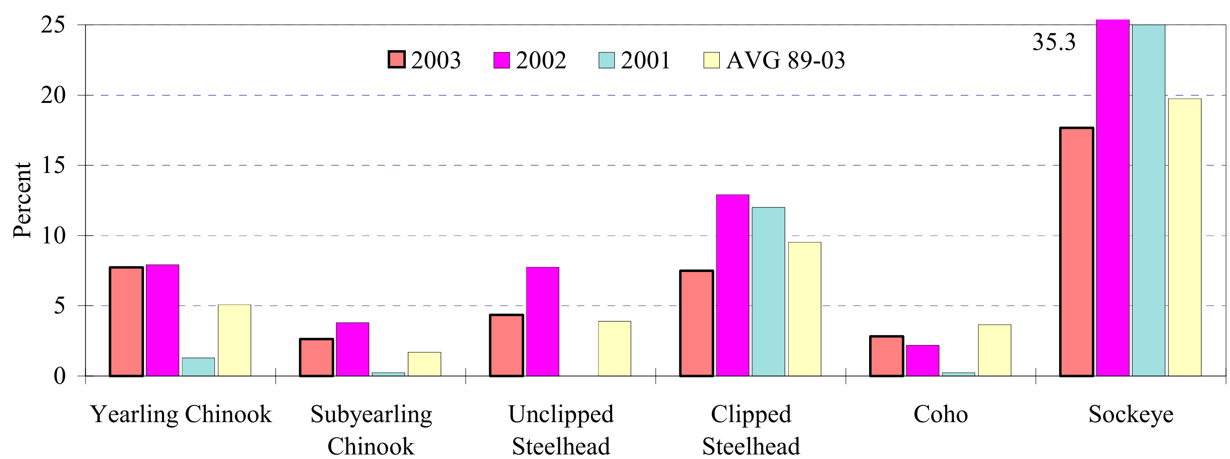


Figure 13. Total descaling for 2003 at PH1, compared to 2002, 2001, and the 89-03 average at Bonneville Dam, PH1.

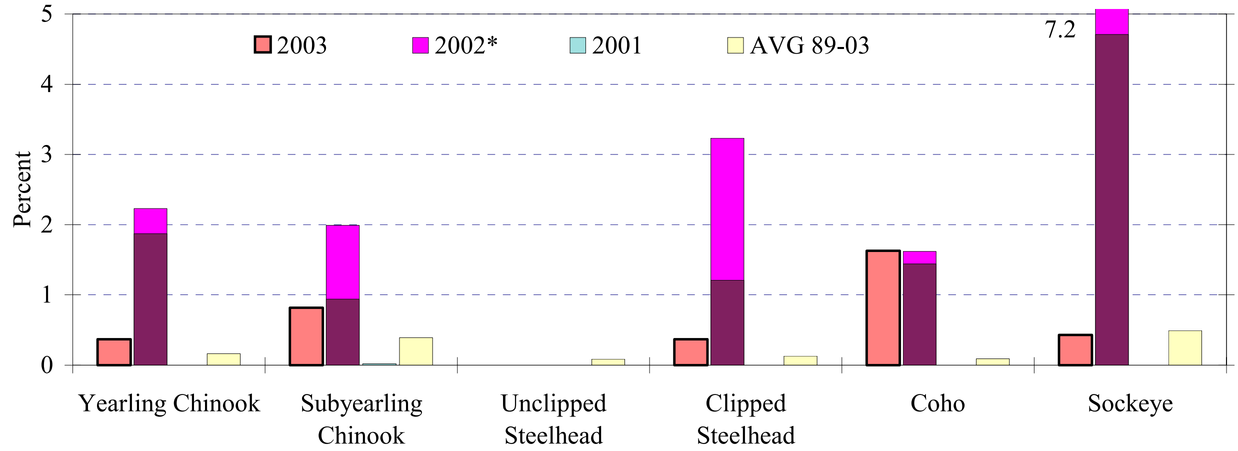


Figure 14. Total mortality for 2003 at PH1, compared to 2002, 2001, and the 89-03 average at Bonneville Dam, PH1. See text below for explanation of the stacked column presentations for 2002.

Mortality
Mortality for all species, except sockeye, returned to typical levels this year after an unusually high rate last year. The high rate was influenced by the 4 June sample when nearly 40% (74) of the season's mortalities were observed. The cause was never identified. In Figure 14, the 2002 data is presented with and without the data from 4 June. The bottom darker colored section represents the annual morality rate without the 4 June data. The upper lighter colored portion represents the annual rate with the 4 June data. Mortality rates are higher for the last two years than the historical rates, with the exception of unclipped steelhead (Figure 14, Table C-3).

Subsampled Fish Condition

Powerhouse 2
Condition data was collected on yearling chinook, steelhead, coho, and sockeye from 19 March to 24 June and subyearling chinook were examined from 19 June through 31 October. This year a total of 19,826 smolts were examined for detailed condition information. Partial descaling (3-19%) ranged from 30.8% for clipped steelhead to 6.7% for subyearling chinook and averaged 12.7% for all species (Table B-4). This is a 9.2% decrease in overall partial descaling from 2002. Similar to 2002, the incidence of attempted bird predation was higher in clipped steelhead (10.8%) than any other species (0.1% to 4.8%). Incidence of external parasites on unclipped steelhead was 5.6%, similar to last year (5.4%), while occurrence in other species was 0.9% or less. Fungus was highest in yearling chinook (2.9%) while other species were 1.1% or less. The frequency of body injuries ranged from 0% to 1.5% for all species, similar to last year. Operculum damage rates were highest on clipped steelhead (3.6%), other species ranged from 0.2% to 1.8%. Additional condition subsampling percentages are presented in Table B-4.

Powerhouse 1
Condition data was collected on yearling chinook, steelhead, coho, and sockeye from 8 April to 23 June and subyearling chinook were examined from 9 June to 23 July. A total of 3,247 smolts were examined for detailed condition subsampling. Partial descaling (3-19%) ranged from 34.1% for clipped steelhead to 7.3% for subyearling chinook and averaged 14.6% for all species (Table C-4). This represents an 8.6% decrease in overall partial descaling from 2002. The incidence of attempted bird predation remained highest for clipped steelhead at 8.8%, similar to last season (9.2%), while occurrence in other species was 3.9% or less. External parasites on unclipped steelhead declined from 6.4% last year to 3.9% this year. Body injury rates were highest on unclipped steelhead at 3.9%, followed by clipped steelhead at 2.7%. For more details on this data and a historical summary of condition subsampling, see Table C-4.

Length Averages
Individual fish lengths were obtained in conjunction with the fish condition subsampling. Since a substantial number of the fish are of hatchery origin, this data is largely a function of size at time of release (Figure 15). Clipped steelhead, as in past years, remained the largest juvenile salmonid sampled throughout the season. On average, clipped and unclipped steelhead increased in length as the season progressed. Yearling chinook and coho lengths remained relatively consistent throughout the season while sockeye average lengths varied. Subyearling

chinook lengths increased slightly from June through August.

In PH1, length data was collected in conjunction with the twice weekly GBT exams and condition sampling. The relative length relationships were similar to those recorded at the JMF. For example, clipped steelhead were the largest followed by unclipped steelhead. Yearling chinook and coho were very similar in size and sockeye length varied.

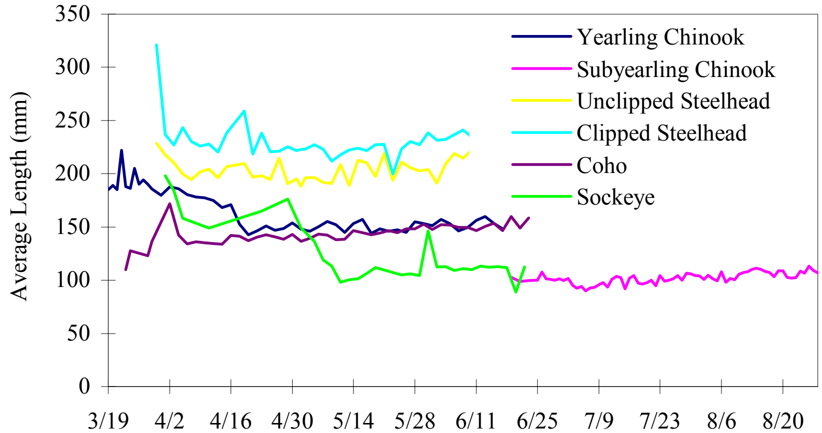


Figure 15. Average lengths for Bonneville PH2 JMF, 2003.

Gas Bubble Trauma (GBT) Monitoring

GBT examinations began on 7 April and concluded on 28 August. Fish were obtained from PH1 samples until 23 June. At that time, STS's were removed and operational priority was placed on the second powerhouse. So even if turbines did operate, fish would not be guided into the bypass system, they would pass through the turbines. Consequently few fish if any were using the bypass system, and the operation was relocated to the JMF for the remainder of the GBT exam season. Gas bubbles were found in only 1 of 3,473 fish examined this year for an overall incidence of 0.03%. The lone symptom was observed on a clipped steelhead in May and was rank 4 in the eyes (Table C-7). No GBT symptoms were found in 2002. For more details on the gas bubble monitoring results, see the FPC annual report.

Passive Integrated Transponder (PIT) tags and External Marks

PIT Tags

A total of 150,576 PIT tags were detected at Bonneville this year, which is 149% of the 100,826 detected in 2002, and the highest number ever recorded at Bonneville (Table B-6). About 93% of the detections were from the JMF (B2J) and the remaining 7% were from the PH1 flat plate (B1J) (Table B-5). Flat plate operation was terminated about four weeks early this year, on 31 July, due to PH2 operation priority, removal of STS's at PH1 during the final week of June, and summer spill. Due to these factors, no PIT tags were detected at B1J in July. Discharge for the entire season averaged 19.5 kcfs at PH1 compared to 87.7 kcfs at PH2. Almost 97.5% of all detections came from chinook (65.6%) and steelhead (31.9%) this year. Table B-6 summarizes historical PIT tag records for all years of interrogation at Bonneville.

Elastomer Tags

A total of 523 elastomer tags were recorded at PH2 this year, which is 64% of the 817 observed in 2002 (Table B-7). The proportion of collected fish with elastomer tags decreased this year, from 2.3% to 0.8%. Most of the tags (46%) were observed in yearling chinook (unknown race) originating from release sites on either the Grande Ronde, Snake, Yakima, Clearwater, or Wallowa Rivers. A smaller percentage of tags (30%) were observed on summer steelhead released in the Wenatchee, Tucannon, or Touchet Rivers. The rest of the elastomer tags were found in yearling spring or fall chinook. In PH1, 41 elastomer tags were recorded this season, down from 63 last year. About 46% were observed on yearling chinook (unknown race) released from the Grande Ronde, Snake, Yakima, Clearwater, or Wallowa Rivers (Table C-5).

Freeze Brands

Four freeze brands were recorded in PH2 this year, down from six in 2002. All of the brands were observed on summer steelhead originating from release sites on the Grande Ronde and Snake rivers (Table B-7). In PH1, one freeze brand was observed on a summer steelhead released from the Grande Ronde River (Table C-5).

Performance Monitoring

Personnel

Our data collection quality control program consists of two people examining the same 10 fish and comparing the results. Discrepancies are discussed while fish are still in the trough. For a full explanation of the test protocol, see the Methods section. The "Descaled" category generated the lowest efficiency rating at 95.3%. Overall, coworkers were in agreement 98.4% of the time (Table 5).

Table 5. Results of quality control tests, 2003.

Categories	ID	Clip	Descaled	Mark	Total
Possible Correct	720	720	720	6	2166
Differences/Errors	0	0	34	0	34
% Correct	100%	100%	95.3%	100%	**98.4%**

Equipment

At the JMF, only 16.75 hours of sampling were missed, about 0.3% of the season (Table 6). At PH1, no sampling was missed due to equipment breakdowns (Table 7).

Table 6. PH2 sampling interruptions, 2003

End Date	Batch Number	Reason for Interruption	Hours Missed
3/22	03081	PDS screen cleaner repairs	9.75
3/28	03087	3-way rotating gate repairs	8
		Total hours missed	**16.75**

Table 7. PH1 sampling interruptions, 2003.

Date	Batch Number	Reason for Interruption	Hours Missed
		Total hours missed	**0**

Primary Dewatering Structure at Juvenile Monitoring Facility

The PDS performed well again this year and no "flooding" or "dry screen" events were recorded. Debris removal was accomplished with a combination of hand cleaning to remove soft debris and operation of the screen cleaner to remove the majority of the large woody debris.

Facility inspections, and other activities make 100% separator coverage impractical. The highest rates of coverage were observed in April and May, months with the highest adult fallback rate and downstream migrant numbers. Coverage ranged from 65% for day shift to 84% for swing shift (Figure 16). For the season, day shift had the lowest average percent PDS and Video coverage (69%) while swing shift had the highest combined coverage (80%).

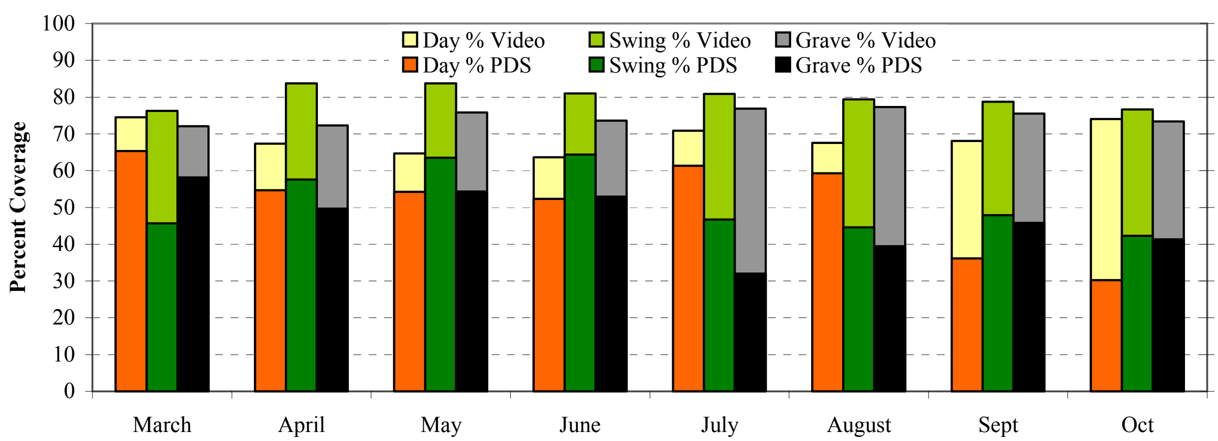


Figure 16. Breakdown of Primary Dewatering Structure coverage into "on the structure" coverage (PDS) and video monitoring (video) by shift, Bonneville Dam, 2003.

PDS coverage rates were highest through June, but from July through the end of the season, less time was spent at the PDS and more at the Video station for all shifts. Day shift PDS coverage declined considerably in September and October. This is due mostly to the day shift person assisting with the processing of juvenile American shad (Figure B-6). In general, as smolt numbers and debris load began tapering off in July, percent PDS coverage declined.

Adult Fallback Observations

The monitoring program adopted in 2002 for stranded kelts and pass by adults continued this season. Staff recorded their time on the PDS and at the video monitoring station as well as their observations. They spent as much time as possible monitoring the separator bars so response time to stranded fish and debris removal could be minimized. Stranded kelts were recorded from 10 March through 28 August, however, fish passing over the separator bars were observed throughout the season. We observed 28 kelts (1.1% of total adults counted at the separator) stranded on or between the separator bars this year, compared to 57 (1.4%) last year. Last year, 20 of the 57, or 35% were recorded as dead upon release. This year, 9 of 28, or 32% were recorded as dead on arrival or dead on release (Table 8). An additional 2,528 adult fish were recorded as they passed over the separator bars.

Table 8. Adult fish fallback data for the Primary Dewatering Structure, 2003.

	Stranded Kelts					Pass By Adults			
	Total	Alive	% Alive	Dead	% Dead	Steelhead	Salmon	Unk. Sal.	Monthly Total
March	2	0	0%	2	100%	257	28		287
April	13	10	77%	3	23%	576	187	24	800
May	10	7	70%	3	30%	650	84	31	775
June	2	2	100%	0	0%	440	68	3	513
July						2	2		4
Aug	1	0	0%	1	100%		1	1	3
Sept.						8	44		52
Oct.						13	110	1	124
Total	28	19	68%	9	32%	1946	524	60	2,558

<u>Incidental Catch</u>

Powerhouse 2

American shad juveniles were the most prevalent incidental species sampled in PH2. Juvenile shad were present in significant numbers in the samples from the middle of August through the end of October and peaked with an estimated 707,945 fish passing through the bypass system on 14 September. Three smaller collection peaks were also observed on 24 October (517,345), 25 October (426,481), and 31 October (422,570). The total collection estimate for juvenile shad in 2003 was 9,603,401, almost one and one-half times the 2002 total of 6,444,156 (Figure B-6, Table B-9).

Pacific lamprey juveniles were found in samples from March through October. Although juvenile lamprey were sampled in every month of the season, there were three distinct peaks; 10 June (6,800), 12 June, (2,500) and 14 June (3,400) (Figure B-6). These are collection estimates generated from the sample rate and represent the estimated number passing through the bypass system that day. Almost 65% (19,679) of juvenile lamprey passage occurred in June and 97% (30,206) of the run had passed the facility by the end of June. The total collection estimate for the season was 30,333 (Table B-9), of which over 99.4% were smolted. This season's collection estimate is about 135% of last year's total of 22,443.

This year, increases were observed in the collection estimates of adult shad (11,708 from 11,102) and peamouth (8,918 from 3,250), while sculpin declined (1,751 from 3,077) and stickleback were only about one percent of last year's collection estimate (997 from 95,689).

Powerhouse 1

Only 31 incidentals were recorded at PH1 this year, down sharply from 529 in 2002. Of those, 14 (45%) were juvenile lamprey and eight (26%) were stickleback. See Table C-6 for a summary of all years of PH1 sampling.

<u>Adult Catch</u>

At the JMF, the separator bars on the PDS juvenile hopper exclude most adult fish from the smolt distribution flumes. However, smaller adults can pass through the bars and in 2003, five chinook jacks were handled. In 2002, six chinook jacks were collected in this manner.

At PH1, the separator bars and reduced sampling effort combined to eliminate any adult bycatch in our samples for the last three years.

Research

During the season, Bonneville smolt monitoring personnel provided support to two research projects listed below. Support included activities such as: fish collection and enumeration, equipment set up, and handling. Fish were collected from the general sample or by the SBC system.

1. Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University

Evaluation of Migration and Survival of Juvenile Salmonids Following Transportation and Evaluation Of Delayed Mortality Of Juvenile Steelhead In The Near Ocean Environment Following Passage Through The Columbia River Hydropower System. Principal Investigator: Carl Schreck. The objectives of this study were aimed at understanding whether barging is affecting, through physiological condition, smolt migration behavior in relation to saltwater entry, vulnerability to avian predators, and survival of barged versus run-of-the-river fish in the Columbia River estuary. A total of 548 clipped steelhead and 360 subyearling fall chinook were collected for this research.

2. Idaho Cooperative Fishery Research Unit, University of Idaho

Evaluation of Physiological Changes in Migrating Chinook Salmon and Effects on Performance and Survival. Principal Investigator: James Congleton. Fish were collected using the Separation by Code (SBC) capabilities of the system. The objectives of this research were: 1) Evaluate comparative survival of in-river passage to multiple bypassed salmon. 2) Compare physiological differences in fish passing through multiple bypass systems from a first time bypass. 3) Evaluate comparative delayed mortality of juvenile salmon utilizing different routes of passage at the dams on the lower Columbia and Snake River system. The SBC system diverted a total of 340 target hatchery spring chinook for this study.

ACKNOWLEDGMENTS

The success of the John Day and Bonneville portions of the Smolt Monitoring Program continues to involve cooperative interaction with the Fish Passage Center staff, the Corps of Engineers project and fisheries personnel at The Dalles/John Day and Bonneville Dams; and the Portland staff of the Pacific States Marine Fisheries Commission.

We would also like to acknowledge the very capable efforts of our Biological technicians and aides, including at Bonneville: John Barton, Kathy Chandler, William Jones, Jayme Martin, Robert B. Mills, Kathleen Richards, David Rockwell, Jerry Rogers, Thomas Ryan, and John Windsor; and at John Day: Jonathan Rerecich.

LITERATURE CITED

Fish Passage Manager, 1999. 1998 Fish Passage Center Annual Report. Columbia Basin Fish and Wildlife Authority, Portland, OR. 93p plus Appendices. (Annual Report to BPA for project no. 94-033, contract DE-FC79-88BP38906).

Gessel, M.H., L.G. Gilbreath, W.D. Muir, and R.F. Krcma, 1986. Evaluation of the Juvenile Collection and Bypass Systems at Bonneville Dam- 1985. U.S. Dept. Comm., NOAA, NMFS, NW&AFC, Seattle, WA. 63p plus Appendices. (Report to U.S. Army Corps of Engineers, Contract DACW57-83-H 001).

Martinson, R. D., J. W. Kamps, G. M. Kovalchuk, D. Ballinger. 1999. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities - 1998. U.S. Dept. of Comm. , NOAA, NMFS, ETSD, Portland, OR. 1998 Annual Report (DOE/BP-20733-11) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 64p.

Martinson, R. D., G. M. Kovalchuk, R. B. Mills, and J. W. Kamps. 1998. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities - 1997. U.S. Dept. of Comm. , NOAA, NMFS, ETSD, Portland, OR. 1997 Annual Report (DOE/BP-20733-11) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 64p.

Krcma, R. F., M. H. Gessel, W. D. Muir, S. C. McCutcheon, L. G. Gilbreath, and B.H.Monk, 1984. Evaluation of the Juvenile Collection and Bypass System at Bonneville Dam-1983. U.S. Dept. Comm., NOAA, NMFS, NW&AFC, Seattle, WA. 56p plus Appendices. (Report to U.S. Army Corps of Engineers, Contract ACW57-83-F-0315).

RELATED PUBLICATIONS

Other project reports and related publications available through the professional literature or from the Bonneville Power Administration Public Information Center - CKPS-1, P.O. Box 3621, Portland, OR. 97208-3621.

1999 - 2002

Martinson, R.D. et al. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities. Pacific States Marine Fisheries Commission, Gladstone, OR. Annual Report to BPA, Project 87-127, Contract DE-AI79-85BP20733.

1995 - 1999

Martinson, R.D. et al. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities. U.S. Dept. of Comm., NOAA, NMFS, ETSD, Portland, OR. Annual Report to BPA, Project 84-014, Contract DE-AI79-85BP20733.

1996

Brege, D. A. et al. Seasonal and Diel Passage of Juvenile Salmonids at John Day Dam on the Columbia River. North American Journal of Fisheries Management 16: 659-665.

1991 - 1994

Hawkes (Wood), L. A. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities. U.S. Dept. of Comm., NOAA, NMFS, ETSD, Portland, OR. Annual Report to BPA, Project 84-014, Contract DE-AI79-85BP20733.

1990

Johnsen, R. C. et al. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric. U.S. Dept. of Comm., NOAA, NMFS, ETSD, Portland, OR. Annual Report to BPA, Project 84-014, Contract DE-AI79-85BP20733.

Table A-1. John Day smolt monitoring program summary, 1998-2003.

	Year	Dates	Sample Rate	Yearling Chinook Sample #	Yearling Chinook Collection	Yearling Chinook Index	All Subyearling Chinook Sample #	All Subyearling Chinook Collection	All Subyearling Chinook Index	Fry Portion Sample #	Fry Portion Collection	Coho Sample #	Coho Collection	Coho Index
Full Bypass	1998	4/9-10/31	.0067-.25	27,732	758,689	1,147,861	31,178	1,584,083	2,155,479	159	4,229	5,330	370,277	572,762
	1999	4/1-10/31	.0067-.5	160,378	1,597,819	2,193,904	232,131	3,090,201	3,962,632	675	7,012	37,941	388,932	543,318
	2000	4/2-9/18	.0067-1	124,788	579,810	827,047	197,340	1,132,204	1,681,685	1,021	6,555	57,716	172,742	263,724
	2001	3/30-9/17	.0067-.25	41,659	948,154	1,006,079	40,215	2,840,619	2,848,404	54	1,352	3,037	79,576	81,644
	2002	3/18-9/16	.007-1	70,901	1,470,332	2,104,942	127,980	2,357,720	3,465,719	315	4,979	9,248	205,548	315,279
	2003	3/31-9/15	.007-1	36,096	1,557,882	2,074,699	109,404	2,020,393	2,713,873	118	1,343	3,532	195,591	258,281

	Year	Dates	Sample Rate	Unclipped Steelhead Sample #	Unclipped Steelhead Collection	Unclipped Steelhead Index	Clipped Steelhead Sample #	Clipped Steelhead Collection	Clipped Steelhead Index	Sockeye Sample #	Sockeye Collection	Sockeye Index	Total Sample #	Total Collection	Total Index
Full Bypass	1998	4/9-10/31	.0067-.25	8,378	296,969	455,339	6,214	408,195	634,446	4,479	338,099	523,866	83,311	3,756,312	5,489,754
	1999	4/1-10/31	.0067-.5	33,545	299,072	418,515	42,003	586,952	820,431	54,710	407,398	574,062	560,708	6,370,374	8,512,862
	2000	4/2-9/18	.0067-1	44,416	188,601	271,975	38,475	182,036	250,020	17,012	41,126	59,951	479,747	2,296,519	3,354,403
	2001	3/30-9/17	.0067-.25	7,567	123,614	124,829	3,394	64,287	66,302	3,023	96,207	103,973	98,895	4,152,457	4,232,594
	2002	3/18-9/16	.007-1	9,837	170,478	245,070	10,842	210,649	300,695	28,933	653,006	934,107	257,741	5,067,733	7,365,812
	2003	3/31-9/15	.007-1	4,373	167,807	218,855	4,983	253,047	334,668	7,821	547,403	726,179	166,209	4,742,123	6,326,556

Table A-2. John Day smolt monitoring program historical summary, 1985-1997.

	Year	Dates[1]	Sub-Sampling	Sample Rate	Yearling Chinook Sample #	Yearling Chinook Collection	Yearling Chinook Index	All Subyearling Chinook Sample #	All Subyearling Chinook Collection	All Subyearling Chinook Index	Fry Portion Sample #	Fry Portion Collection	Coho Sample #	Coho Collection	Coho Index
Single Gatewell Airlift	1985[2]	4/27-10/29	NO	1	63,578	63,578		226,577	226,577				600	600	
	1986	3/28-10/30	NO	1	92,591	92,951		182,117	182,117				1,994	1,994	
	1987	4/1-11/30	NO	1	84,455	84,455	1,020,76	95,505	95,505	760,605	780	780	13,200	13,200	170,353
	1988	3/30-10/31	NO	1	34,045	34,045	408,675	109,448	109,448	363,101	3,800	3,800	8,650	8,650	109,325
	1989	3/28-10/31	NO	1	34,930	34,930	502,642	129,870	129,870	1,017,342	3,922	3,922	6,930	6,930	99,811
	1990(5b)	3/27-10/31	NO	1	26,992	26,992	361,968	39,602	39,602	513,669	30	30	6,261	6,261	84,342
	1991	4/7-10/31	NO	1	26,878	26,878	374,387	46,785	46,785	568,206	513	513	5,106	5,106	72,725
	1992(3c)	3/25-10/13	NO	1	23,052	23,052	NA	27,407	27,407	NA	141	141	5,887	5,887	NA
	1992(3b)	3/25-10/13	NO	1	19,179	19,179	237,172	32,376	32,376	294,861		294,861	3,917	3,917	48,898
	1993(3c)	4/6-10/29	NO	1	11,054	11,054	NA	50,243	50,243	NA	1,317	1,317	3,437	3,437	NA
	1993(3b)	4/6-10/29	NO	1	41,767	41,767	720,361	66,561	66,561	717,434		717,434	9,727	9,727	173,193
	1994	4/5-9/30	NO	1	34,071	34,199	446,854	75,164	121,272	1,207,368	47	47	11,385	11,413	151,135
	1995	4/6-9/29	YES	.25-1	34,308	90,348	1,329,22	48,896	90,350	1,240,260	507	1,350	5,908	22,135	335,902
	1996	4/8-9/9	YES	.25-1	14,560	38,975	738,311	31,157	46,232	737,841	105	217	8,551	27,043	504,863
	1997	4/8-9/8	YES	.25-1	4,586	7,646	154,026	20,487	24,333	448,328	1,305	2,342	3,409	6,615	147,267

	Year	Dates	Sub-Sampling	Sample Rate	Unclipped Steelhead Sample #	Unclipped Steelhead Collection	Unclipped Steelhead Index	Clipped Steelhead[4] Sample #	Clipped Steelhead Collection	Clipped Steelhead Index	Sockeye Sample #	Sockeye Collection	Sockeye Index	Total Sample #	Total Collection	Total Index
Single Gatewell Airlift	1985[3]	4/27-10/29	NO	1	36,616	36,616					17,235	17,235		344,606	344,606	
	1986	3/28-10/30	NO	1	37,822	37,822					17,505	17,505		332,029	332,389	
	1987	4/1-11/30	NO	1	23,988	23,988	300,410				11,911	11,911	145,232	229,059	229,059	2,397,368
	1988	3/30-10/31	NO	1	14,985	14,985	179,089				6,333	6,333	80,406	173,461	173,461	1,140,596
	1989	3/28-10/31	NO	1	19,818	19,818	281,685				5,496	5,496	78,190	197,044	197,044	1,979,670
	1990	3/27-10/31	NO	1	5,028	5,028	68,428	4,921	4,921	6,349	1,755	1,755	23,592	84,559	84,559	1,058,348
	1991	4/7-10/31	NO	1	5,456	5,456	75,687	11,166	11,166	158,305	3,450	3,450	52,203	98,841	98,841	1,301,513
	1992(3c)	3/25-10/13	NO	1	2,770	2,770	NA	6,917	6,917	NA	1,647	1,647	NA	67,680	67,680	NA
	1992(3b)	3/25-10/13	NO	1	2,371	2,371	28,712	5,053	5,053	63,494	961	961	12,051	63,857	63,857	685,188
	1993(3c)	4/6-10/29	NO	1	4,668	4,668	NA	7,416	7,416	NA	813	813	NA	77,631	77,631	NA
	1993(3b)	4/6-10/29	NO	1	11,374	11,374	189,400	45,520	45,520	882,474	14,072	14,072	272,869	189,021	189,021	2,955,731
	1994	4/5-9/30	NO	1	7,604	7,604	96,800	14,454	14,457	189,420	7,260	7,270	96,621	149,938	196,215	2,188,198
	1995	4/6-9/29	YES	.25-1	4,043	11,584	170,993	18,915	61,385	919,021	5,625	19,526	293,065	117,695	295,328	4,288,470
	1996	4/8-9/9	YES	.25-1	3,973	11,903	228,911	11,171	36,174	701,899	1,147	3,373	64,584	70,559	163,700	2,976,409
	1997	4/8-9/8	YES	.25-1	4,011	7,337	151,061	13,645	28,547	614,087	738	1,184	26,519	46,876	75,662	1,541,288

For a diagram of the airlift system, see Figure A-13. For a description of the airlift, see Martinson, et al, 1997.

[1] Sampling conducted 24/7 for all years.
[2] Unit 3B was out of service from April 2-26 for STS installations and testing.
[3] 3C airlift in-operational 5/13-6/18.
[4] Unclipped and clipped steelhead were not differentiated prior to 1990.

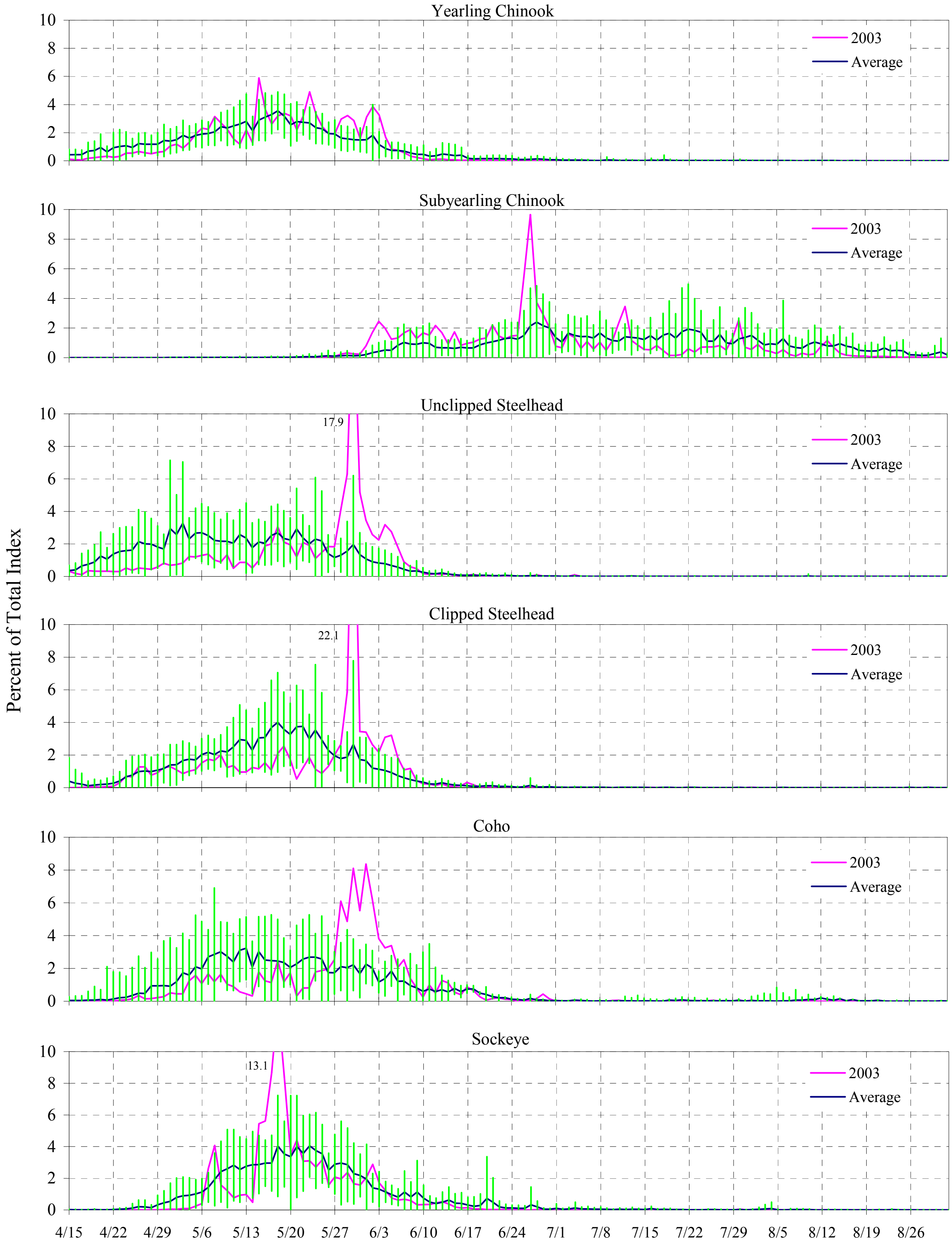


Figure A-1. John Day daily passage for 2003 with the 1985-present average and standard deviation.

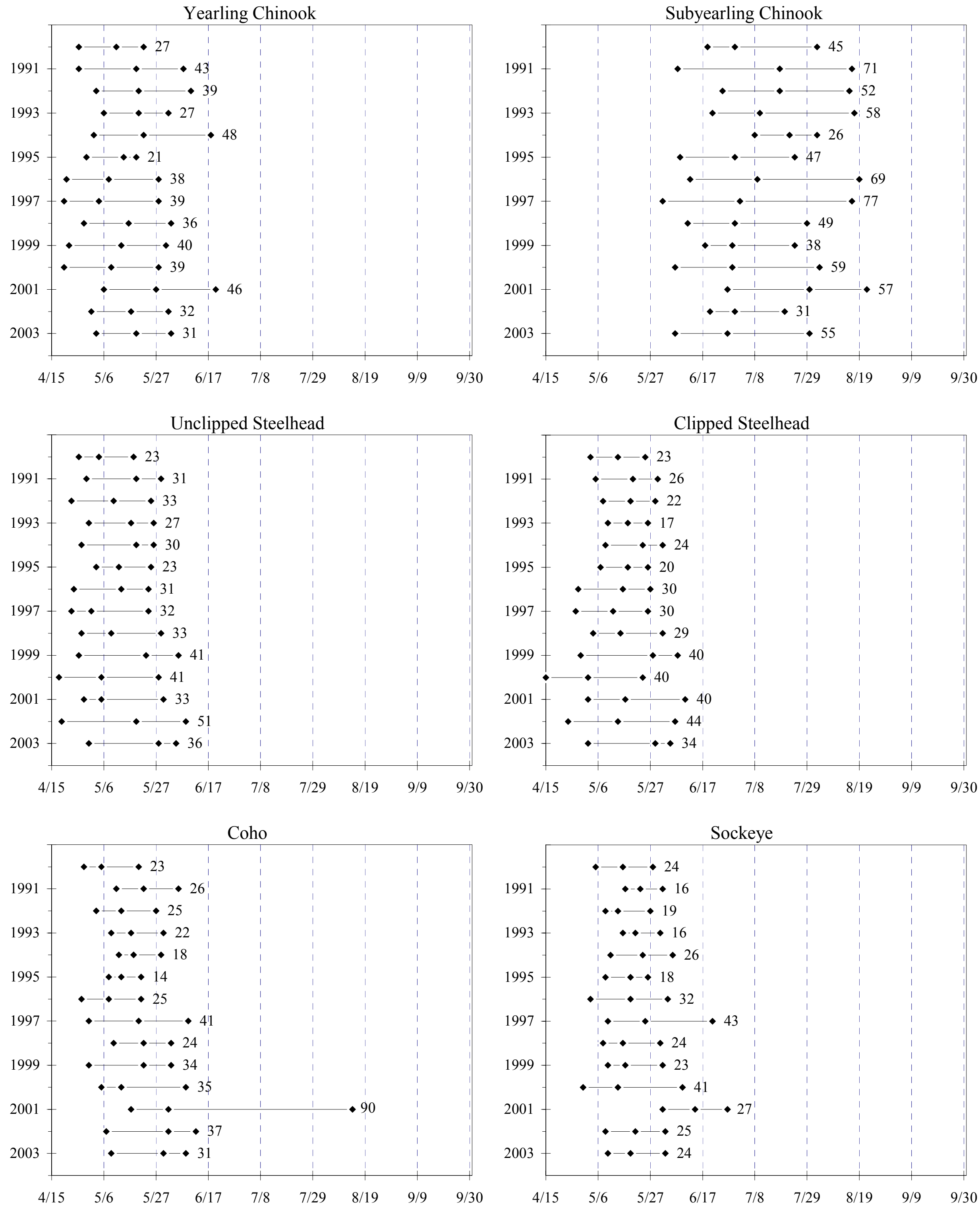


Figure A-2. John Day 10%, 50%, and 90% passage dates by species, 1990-present. The number of days between 10-90% dates is indicated for each year.

Table A-3. John Day 10%, 50%, and 90% passage dates by species, 1990 to present, with duration of middle 80% in days.

	Yearling Chinook				
		10 %	50%	90 %	# of Days
Single Gatewell Airlift	1990[1]	26-Apr	11-May	22-May	27
	1991	26-Apr	19-May	7-Jun	43
	1992	3-May	20-May	10-Jun	39
	1993	6-May	20-May	1-Jun	27
	1994	2-May	22-May	18-Jun	48
	1995	29-Apr	14-May	19-May	21
	1996	21-Apr	8-May	28-May	38
	1997	20-Apr	4-May	28-May	39
Full Bypass	1998	28-Apr	16-May	2-Jun	36
	1999	22-Apr	13-May	31-May	40
	2000	20-Apr	9-May	28-May	39
	2001	6-May	27-May	20-Jun	46
	2002	1-May	17-May	1-Jun	32
	2003	3-May	19-May	2-Jun	31
	MEDIAN	28-Apr	16-May	1-Jun	35
	MIN	20-Apr	4-May	19-May	21
	MAX	6-May	27-May	20-Jun	48

	Subyearling Chinook				
		10 %	50%	90 %	# of Days
Single Gatewell Airlift	1990[1]	19-Jun	30-Jun	2-Aug	45
	1991	7-Jun	18-Jul	16-Aug	71
	1992	25-Jun	18-Jul	15-Aug	52
	1993	21-Jun	10-Jul	17-Aug	58
	1994	8-Jul	22-Jul	2-Aug	26
	1995	8-Jun	30-Jun	24-Jul	47
	1996	12-Jun	9-Jul	19-Aug	69
	1997	1-Jun	2-Jul	16-Aug	77
Full Bypass	1998	11-Jun	30-Jun	29-Jul	49
	1999	18-Jun	29-Jun	25-Jul	38
	2000	6-Jun	29-Jun	3-Aug	59
	2001	27-Jun	30-Jul	22-Aug	57
	2002	20-Jun	30-Jun	20-Jul	31
	2003	6-Jun	27-Jun	30-Jul	55
	MEDIAN	15-Jun	1-Jul	2-Aug	50
	MIN	1-Jun	27-Jun	20-Jul	26
	MAX	8-Jul	30-Jul	22-Aug	77

	Unclipped Steelhead				
		10 %	50%	90 %	# of Days
Single Gatewell Airlift	1990[1]	26-Apr	4-May	18-May	23
	1991	29-Apr	19-May	29-May	31
	1992	23-Apr	10-May	25-May	33
	1993	30-Apr	17-May	26-May	27
	1994	27-Apr	19-May	26-May	30
	1995	3-May	12-May	25-May	23
	1996	24-Apr	13-May	24-May	31
	1997	23-Apr	1-May	24-May	32
Full Bypass	1998	27-Apr	9-May	29-May	33
	1999	26-Apr	23-May	5-Jun	41
	2000	18-Apr	5-May	28-May	41
	2001	28-Apr	5-May	30-May	33
	2002	19-Apr	19-May	8-Jun	51
	2003	30-Apr	28-May	4-Jun	36
	MEDIAN	26-Apr	12-May	27-May	32
	MIN	18-Apr	1-May	18-May	23
	MAX	3-May	28-May	8-Jun	51

	Hatchery Steelhead				
		10 %	50%	90 %	# of Days
Single Gatewell Airlift	1990[1]	3-May	14-May	25-May	23
	1991	5-May	20-May	30-May	26
	1992	8-May	19-May	29-May	22
	1993	10-May	18-May	26-May	17
	1994	9-May	24-May	1-Jun	24
	1995	7-May	18-May	26-May	20
	1996	28-Apr	16-May	27-May	30
	1997	27-Apr	12-May	26-May	30
Full Bypass	1998	4-May	15-May	1-Jun	29
	1999	29-Apr	28-May	7-Jun	40
	2000	15-Apr	2-May	24-May	40
	2001	2-May	17-May	10-Jun	40
	2002	24-Apr	14-May	6-Jun	44
	2003	2-May	29-May	4-Jun	34
	MEDIAN	2-May	17-May	29-May	28
	MIN	15-Apr	2-May	24-May	17
	MAX	10-May	29-May	10-Jun	44

	Coho				
		10 %	50%	90 %	# of Days
Single Gatewell Airlift	1990[1]	28-Apr	5-May	20-May	23
	1991	11-May	22-May	5-Jun	26
	1992	3-May	13-May	27-May	25
	1993	9-May	17-May	30-May	22
	1994	12-May	18-May	29-May	18
	1995	8-May	13-May	21-May	14
	1996	27-Apr	8-May	21-May	25
	1997	30-Apr	20-May	9-Jun	41
Full Bypass	1998	10-May	22-May	2-Jun	24
	1999	30-Apr	22-May	2-Jun	34
	2000	5-May	13-May	8-Jun	35
	2001	17-May	1-Jun	14-Aug	90
	2002	7-May	1-Jun	12-Jun	37
	2003	9-May	30-May	8-Jun	31
	MEDIAN	7-May	19-May	2-Jun	27
	MIN	27-Apr	5-May	20-May	14
	MAX	17-May	1-Jun	14-Aug	90

	Sockeye				
		10 %	50%	90 %	# of Days
Single Gatewell Airlift	1990[1]	5-May	16-May	28-May	24
	1991	17-May	23-May	1-Jun	16
	1992	9-May	14-May	27-May	19
	1993	16-May	21-May	31-May	16
	1994	11-May	24-May	5-Jun	26
	1995	9-May	19-May	26-May	18
	1996	3-May	19-May	3-Jun	32
	1997	10-May	25-May	21-Jun	43
Full Bypass	1998	8-May	16-May	31-May	24
	1999	10-May	17-May	1-Jun	23
	2000	30-Apr	14-May	9-Jun	41
	2001	1-Jun	14-Jun	27-Jun	27
	2002	9-May	21-May	2-Jun	25
	2003	10-May	19-May	2-Jun	24
	MEDIAN	9-May	19-May	1-Jun	24
	MIN	30-Apr	14-May	26-May	16
	MAX	1-Jun	14-Jun	27-Jun	43

[1] Sample unit was out of service May 30 - June 9.

Figure A-3. John Day daily percent descaling, mortality, and river flow, 2003. Days with sample size of less than 30 have been excluded. **Note percent of sample scale differences for steelhead**.

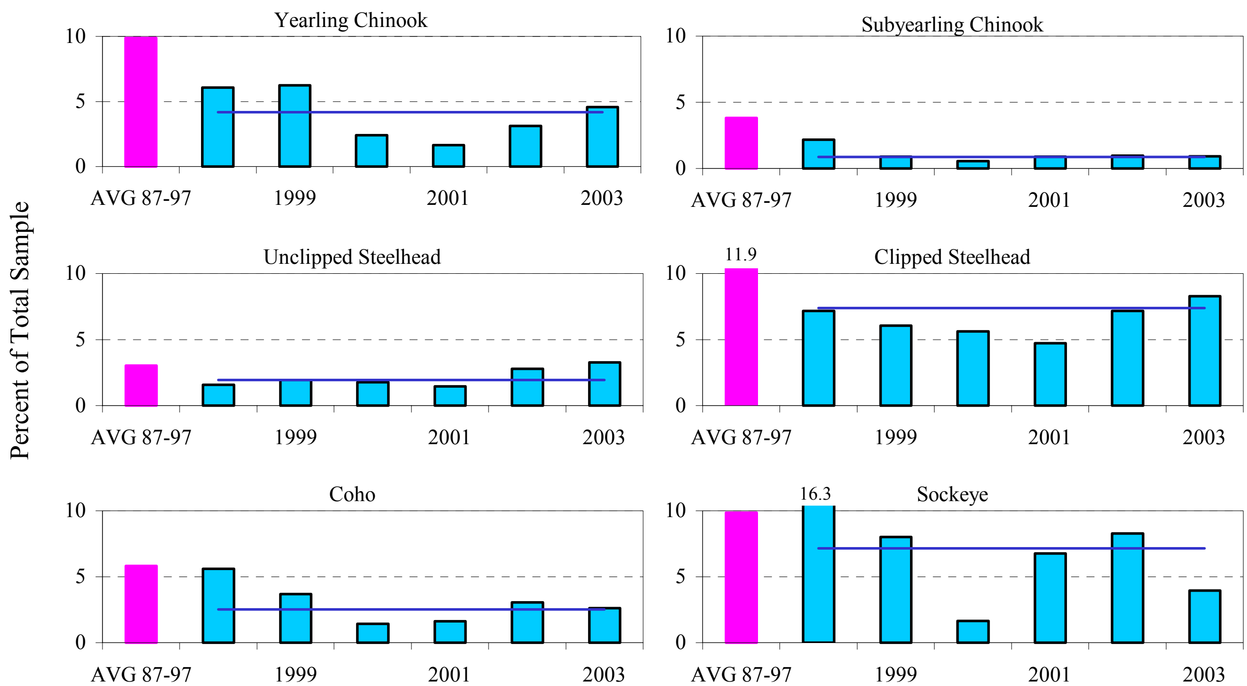


Figure A-4. John Day annual descaling rates for full bypass sampling (1998-present) with the average line, compared to the average for the airlift pump system (1987-1997).

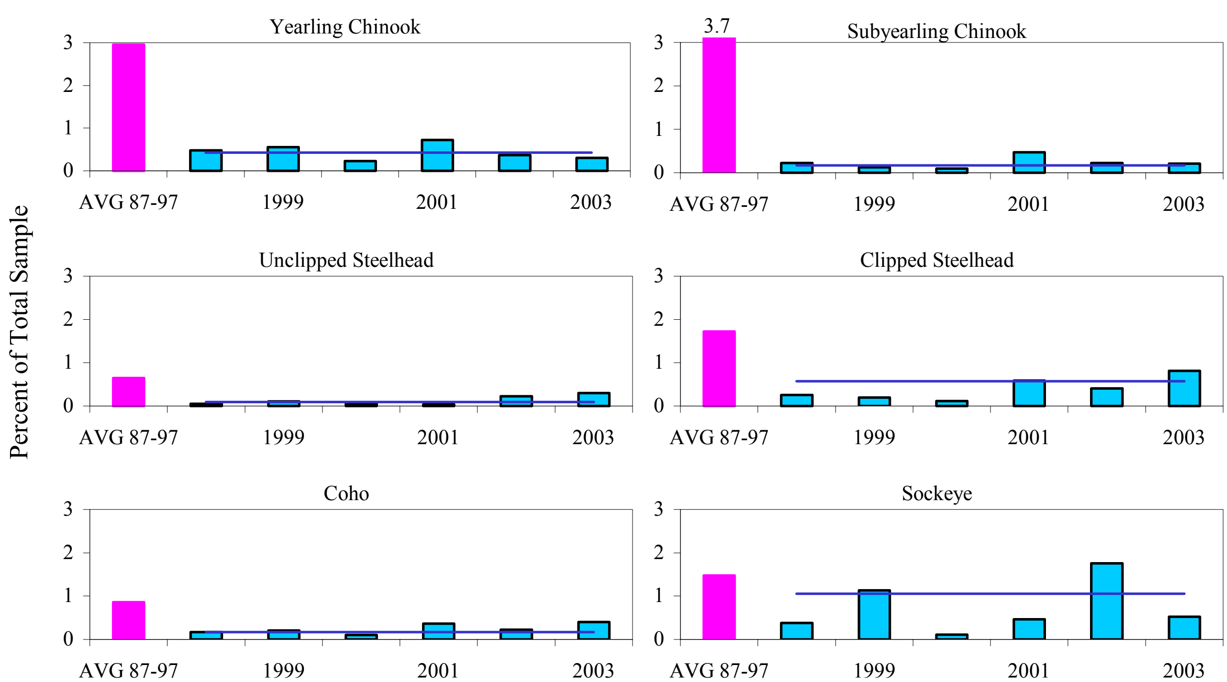


Figure A-5. John Day annual mortality rates for full bypass sampling (1998-present) with the average line, compared to the average for the airlift pump system (1987-1997).

Table A-4. John Day annual descaling and mortality data, 1998-present, and the average, minimum, and maximums from the airlift sampling system, 1987-1997.

		YEARLING CHINOOK					SUBYEARLING CHINOOK				
	YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
AVG	1987-1997	35,443	3,394	9.9	1,047	3.0	70,318	2,588	3.8	2,634	3.7
MIN	1987-1997	4,586	859	19.1	84	1.8	20,487	1,119	5.5	322	1.6
MAX	1987-1997	84,455	5,617	6.9	2,464	2.9	129,870	5,922	4.8	6,413	4.9
Full Bypass	1998	27,732	1,675	6.1	133	0.5	31,178	678	2.2	70	0.2
Full Bypass	1999	160,378	9,952	6.2	882	0.5	232,131	2,094	0.9	282	0.1
Full Bypass	2000	124,788	3,001	2.4	289	0.2	197,340	1,102	0.6	186	0.1
Full Bypass	2001	41,659	685	1.7	300	0.7	40,215	355	0.9	189	0.5
Full Bypass	2002	70,901	2,210	3.1	259	0.4	127,980	1,243	1.0	285	0.2
Full Bypass	2003	36,096	1,643	4.6	108	0.3	109,404	993	0.9	228	0.2
Bypass Average		76,926	3,194	4.2	329	0.4	123,041	1,078	0.9	207	0.2

		UNCLIPPED STEELHEAD					CLIPPED STEELHEAD				
	YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
AVG	1987-1997	10,008	300	3.0	64	0.6	15,478	1,813	11.9	267	1.7
MIN	1987-1997	3,973	130	3.3	3	0.1	4,921	634	12.9	24	0.5
MAX	1987-1997	23,988	530	2.2	294	1.2	52,936	6,562	12.6	1,049	2.0
Full Bypass	1998	8,378	132	1.6	4	0.0	6,214	444	7.2	16	0.3
Full Bypass	1999	33,545	649	1.9	36	0.1	42,003	2,537	6.1	83	0.2
Full Bypass	2000	44,416	789	1.8	26	0.1	38,475	2,159	5.6	44	0.1
Full Bypass	2001	7,567	109	1.4	3	0.0	3,394	159	4.7	20	0.6
Full Bypass	2002	9,837	274	2.8	22	0.2	10,842	775	7.2	44	0.4
Full Bypass	2003	4,373	142	3.3	13	0.3	4,983	432	8.7	15	0.3
Bypass Average		18,019	349	1.9	17	0.1	17,652	1,084	6.2	37	0.2

		COHO					SOCKEYE				
	YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
AVG	1987-1997	8,397	484	5.8	72	0.9	5,564	540	9.8	82	1.5
MIN	1987-1997	3,409	244	7.2	3	0.1	738	84	11.4	4	0.5
MAX	1987-1997	13,200	741	5.7	281	2.1	14,885	1,630	11.3	397	2.7
Full Bypass	1998	5,330	297	5.6	9	0.2	4,479	726	16.3	17	0.4
Full Bypass	1999	37,941	1,397	3.7	78	0.2	54,710	4,331	8.0	619	1.1
Full Bypass	2000	57,716	819	1.4	59	0.1	17,012	280	1.6	18	0.1
Full Bypass	2001	3,037	49	1.6	11	0.4	3,023	203	6.7	14	0.5
Full Bypass	2002	9,248	282	3.1	21	0.2	28,933	2,354	8.3	509	1.8
Full Bypass	2003	3,532	92	2.6	14	0.4	7,821	307	3.9	41	0.5
Bypass Average		19,467	489	2.5	32	0.2	19,330	1,367	7.1	203	1.1

Table A-5. John Day annual condition subsampling data, 1998-present using the full bypass, as a percent of sample, and 1985-1997, shown as the average, minimum, and maximums observed using the airlift sampling system.

YEAR	n	3-19%	INJURY					DISEASE				PREDATION	
		DESC	HD	OP	PE	BD	HM	PAR	COL	FUN	BKD	BIRD	OT
Yearling Chinook													
Airlift Sampling Summary													
Avg	2,010	16.9	0.9	0.6	0.2	2.5	1.6	0.4	0.4	0.6	0.7	1.1	1.2
Min	950	10.2	0.3	0.1	0.2	0.3	0.9	0.0	0.0	0.0	0.0	0.0	0.8
Max	3,995	29.7	2.2	1.6	0.2	6.2	2.7	1.5	0.7	1.7	2.6	2.4	1.5
Full Bypass													
1998	2,606	11.2	0.3	0.6	0.5	1.1	1.9	0.1	0.1	0.7	0.9	1.1	0.3
1999	2,753	15.7	0.3	0.7	0.4	1.6	2.1	0.4	0.0	0.8	0.7	1.2	0.8
2000	2,541	8.9	0.2	0.2	0.2	1.8	0.1	0.0	0.0	1.2	0.7	1.4	0.2
2001	3,955	6.6	0.1	0.1	0.1	0.9	0.3	0.4	0.1	0.3	1.0	1.9	0.2
2002	3,917	6.1	0.7	0.7	0.2	1.0	0.6	1.7	0.0	1.6	0.7	2.1	0.3
2003	3,869	7.8	0.6	0.9	0.5	1.7	1.1	2.4	0.0	1.1	0.3	1.4	1.2
Unclipped Steelhead													
Airlift Sampling Summary													
Avg	1,216	12.2	1.1	1.4	0.3	2.0	0.9	2.2	0.1	1.4	0.0	0.6	0.9
Min	476	6.6	0.1	0.6	0.2	0.0	0.4	0.0	0.0	0.0	0.0	2.4	0.3
Max	2,265	21.3	2.5	2.9	0.4	7.5	1.5	15.2	0.3	3.5	0.2	3.4	1.5
Full Bypass													
1998	1,707	3.6	0.2	0.1	0.1	0.4	0.3	2.4	0.1	0.2	0.0	1.8	0.2
1999	2,334	9.3	0.3	0.7	0.1	2.6	1.7	5.0	0.0	1.0	0.1	4.9	0.6
2000	2,304	10.1	0.0	0.0	0.1	1.6	0.0	2.5	0.0	0.4	0.1	2.7	0.0
2001	1,715	5.1	0.2	0.1	0.0	1.2	0.1	8.2	0.0	0.5	0.0	2.0	0.1
2002	2,921	6.4	0.8	1.0	0.0	1.2	0.4	5.3	0.0	1.3	0.0	5.1	0.2
2003	2,092	8.7	0.6	1.1	0.5	1.9	0.4	8.4	0.1	2.0	0.0	5.4	0.6
Coho													
Airlift Sampling Summary													
Avg	1,022	11.5	0.4	0.8	0.1	0.2	0.2	0.4	0.0	0.9	0.0	0.7	0.6
Min	96	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0
Max	2,166	21.5	2.1	2.7	0.2	0.7	0.3	1.2	0.1	2.7	0.2	3.8	1.2
Full Bypass													
1998	1,374	5.9	0.1	0.5	0.4	1.5	0.7	0.0	0.1	0.3	0.1	1.8	0.8
1999	2,767	11.7	0.2	0.5	0.1	1.3	1.0	0.4	0.0	0.4	0.2	1.5	1.2
2000	2,399	5.0	0.2	0.2	0.0	1.2	0.1	0.4	0.0	0.3	0.0	1.1	0.1
2001	591	3.9	0.2	0.2	0.0	0.8	0.0	0.2	0.3	0.0	0.2	1.0	0.5
2002	2,191	6.7	0.6	0.4	0.0	0.7	0.1	0.6	0.0	0.8	0.2	2.3	0.3
2003	1,113	7.4	0.1	0.1	0.0	0.7	0.4	0.7	0.0	0.3	0.0	1.7	1.2

YEAR	n	3-19%	INJURY					DISEASE				PREDATION	
		DESC	HD	OP	PE	BD	HM	PAR	COL	FUN	BKD	BIRD	OT
Subyearling Chinook													
Airlift Sampling Summary													
Avg	3,874	9.3	0.5	1.5	0.1	0.4	0.9	3.2	1.4	0.1	0.1	0.1	0.7
Min	2,340	4.1	0.0	0.1	0.1	0.0	0.4	0.0	0.9	0.0	0.1	0.3	0.3
Max	5,869	15.0	1.8	3.8	0.1	1.6	1.1	12.8	3.8	0.4	0.9	0.4	1.5
Full Bypass													
1998	5,169	7.7	0.2	0.3	0.0	1.5	4.0	0.2	0.1	0.2	0.1	0.2	0.5
1999	8,767	4.8	0.1	0.4	0.0	1.4	0.8	0.1	0.1	0.1	0.0	0.3	0.8
2000	9,823	2.8	0.1	0.1	0.0	1.1	0.3	0.1	0.0	0.1	0.0	0.1	0.5
2001	9,588	8.1	0.1	0.2	0.0	1.1	2.0	0.0	0.0	0.0	0.2	0.1	0.6
2002	14,382	4.7	0.1	0.3	0.0	1.1	1.5	0.1	0.0	0.0	0.1	0.2	1.3
2003	16,073	4.4	0.0	0.4	0.0	1.4	2.1	0.0	0.0	0.1	0.0	0.2	0.8
Clipped Steelhead													
Airlift Sampling Summary													
Avg	1,646	29.0	1.8	4.4	0.4	2.2	1.2	2.6	0.1	5.2	0.0	5.3	2.2
Min	507	14.6	0.3	1.2	0.1	0.1	0.6	0.5	0.0	0.7	0.0	7.2	0.8
Max	2,371	41.1	4.5	9.9	0.7	6.6	1.6	7.1	0.1	15.1	0.1	15.1	3.9
Full Bypass													
1998	1,510	12.8	0.7	2.3	0.5	3.7	1.1	0.4	0.1	1.2	0.1	7.6	0.3
1999	2,716	19.3	0.6	2.4	0.2	4.3	1.8	0.1	0.0	1.3	0.0	8.4	1.3
2000	1,990	18.3	0.4	0.7	0.1	3.1	0.1	0.7	0.1	0.9	0.0	6.9	0.2
2001	1,043	13.0	0.6	0.4	0.0	2.2	0.2	2.8	0.0	2.4	0.0	7.3	0.3
2002	2,765	11.1	1.3	1.6	0.1	2.4	0.3	5.5	0.0	4.6	0.0	10.6	0.3
2003	1,874	16.7	1.2	2.1	0.5	2.6	0.5	1.5	0.1	4.3	0.1	9.2	1.0
Sockeye													
Airlift Sampling Summary													
Avg	788	13.6	0.6	1.3	0.2	0.3	0.6	0.2	0.1	0.2	0.0	0.1	0.6
Min	219	6.1	0.0	0.3	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.5	0.0
Max	1,766	20.3	1.5	3.2	0.9	1.9	0.9	0.8	0.2	0.5	0.3	1.0	0.9
Full Bypass													
1998	1,268	15.5	0.1	1.4	0.2	0.5	0.9	0.0	0.0	0.2	0.1	0.1	0.2
1999	1,864	19.0	0.2	1.9	0.2	1.6	1.2	0.0	0.0	0.8	0.1	0.8	0.2
2000	1,463	6.9	0.8	0.8	0.1	0.9	0.0	0.1	0.0	0.2	0.1	0.1	0.1
2001	828	15.7	0.0	0.6	0.1	1.3	0.8	0.0	0.1	0.4	0.1	0.5	0.1
2002	2,328	12.0	0.9	2.6	0.1	1.0	0.9	0.0	0.0	1.8	0.1	0.1	0.0
2003	1,558	9.3	0.5	1.9	0.4	0.6	0.8	0.0	0.0	0.2	0.0	0.1	0.0

HD- Head Injury; OP - Opercula Injury; PE - Pop Eye; BD - Body Injury; and HM - Hemorrhage. PAR - Parasites; COL - Columnaris; FUN - Fungus; and BKD - Bacterial Kidney Disease symptoms. BIRD - Bird strikes; OT - Other predators.

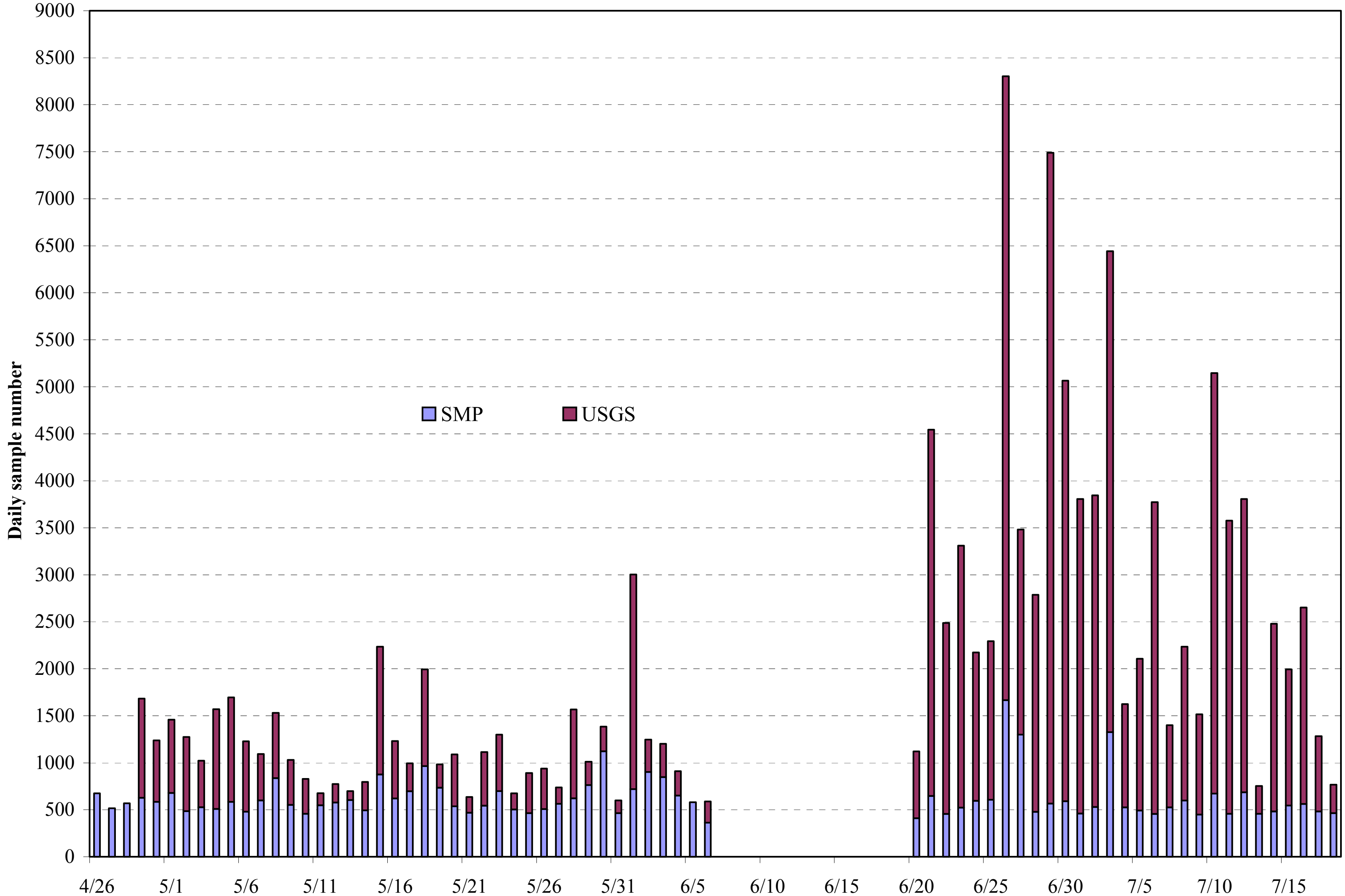


Figure A-6. Division of sampled fish for ESA permit allocation to the SMP and USGS permits, John Day, 2003.

Table A-6. John Day PIT tag summary, 2003.

Migration Year	Species	Run	Rear	Observations	Species Totals	Migration Year Totals
2000	Steelhead	Summer	Wild	1	1 Steelhead	**1**
2001	Steelhead	Summer	Wild	11	11 Steelhead	**11**
2002	Chinook	Spring	Wild	444		
	Chinook	Summer	Hatchery	1		
	Chinook	Summer	Wild	4		
	Chinook	Fall	Hatchery	435		
	Chinook	Fall	Unknown	6		
	Chinook	Fall	Wild	1		
	Chinook	Unknown	Unknown	13		
	Chinook	Unknown	Wild	18	922 Chinook	
	Steelhead	Summer	Hatchery	5		
	Steelhead	Summer	Wild	62		
	Steelhead	Unknown	Wild	63	130 Steelhead	
	Unknown	Unknown	Unknown	1	1 Unknown	**1,053**
2003	Chinook	Spring	Hatchery	81,102		
	Chinook	Spring	Wild	5,619		
	Chinook	Summer	Hatchery	37,931		
	Chinook	Summer	Unknown	1		
	Chinook	Summer	Wild	1,331		
	Chinook	Fall	Hatchery	11,683		
	Chinook	Fall	Unknown	340		
	Chinook	Fall	Wild	104		
	Chinook	Unknown	Hatchery	1,483		
	Chinook	Unknown	Unknown	168		
	Chinook	Unknown	Wild	5,261	145,023 Chinook	
	Coho	Spring	Wild	2		
	Coho	Fall	Hatchery	2,142		
	Coho	Fall	Unknown	186		
	Coho	Unknown	Hatchery	202		
	Coho	Unknown	Unknown	85		
	Coho	Unknown	Wild	10	2,627 Coho	
	Steelhead	Summer	Hatchery	47,461		
	Steelhead	Summer	Wild	2,301	49,762 Steelhead	
	Sockeye	Summer	Hatchery	128		
	Sockeye	Summer	Wild	44	172 Sockeye	
	Unknown	Unknown	Unknown	18	18 Unknown	**197,602**
					Total Observations at John Day:	**198,667**

Species Summary	Chinook	Coho	Steelhead	Sockeye	Unknown
Number	145,945	2,627	49,904	172	19
Percentage	73.5	1.3	25.1	0.1	0.01

Table A-7. John Day historical PIT tag detections, 1998-present, and the 1993-1997 average.

Species	Run	Rearing Type	1993-1997 Average	1998	1999	2000	2001	2002	2003
				Full Bypass					
Chinook	Spring	Hatchery	283	8,528	21,928	4,420	11,267	72,237	81,102
		Wild	36	1,242	3,804	2,438	3,308	3,753	6,063
		Unknown				28		1,677	
	Summer	Hatchery	59	3,656	2,502	5,782	38,291	14,157	37,932
		Wild	17	832	3,024	1,023	1,391	1,228	1,335
		Unknown	1	1				48	1
	Fall	Hatchery	57	12,174	7,046	4,375	9,346	14,511	12,118
		Wild	8	282	552	541	942	90	105
		Unknown		3	7,205	3,762	9,385	11,658	346
	Unknown	Hatchery	356	5,964	17,649	1,472	3,147	5,091	1,483
		Wild	91	1,190	3,948	3,331	256	4,060	5,279
		Unknown	55	3,340	5,748	254	450	419	181
Chinook Total			959	37,212	73,406	27,426	77,783	128,929	145,945
Steelhead	Spring	Hatchery	5						
		Wild			327				
	Summer	Hatchery	691	8,109	55,135	8,070	1,147	2,662	47,466
		Wild	81	2,510	4,106	5,390	572	2,653	2,375
		Unknown	1	10	18	1		51	
	Unknown	Hatchery		63					
		Wild							63
Steelhead Total			774	10,692	59,586	13,461	1,719	5,366	49,904
Coho	Fall	Hatchery	7	652	4,433	780	493	2,212	2,142
		Wild				12	6		
		Unknown		484	562	1	71	59	186
	Spring	Hatchery	3		1	22			
		Wild							2
		Unknown				2			
	Unknown	Hatchery			1			67	202
		Wild							10
		Unknown						130	85
Coho Total			9	1,136	4,997	817	570	2,468	2,627
Sockeye	Spring	Hatchery	10						
	Summer	Hatchery	8	186	207	26	13	56	128
		Wild	3	16	30	7		31	44
	Unknown	Hatchery	7	13	37		5	25	
		Wild	8	355	442	43	187	183	
		Unknown		4		47			
Sockeye Total			16	574	716	123	205	295	172
Unknown	Unknown	Wild		1				357	
		Unknown				21	5	8	19
Unknown Total				1		21	5	365	19
TOTALS (all species combined) =			**1,751**	**49,615**	**138,705**	**41,848**	**80,282**	**137,423**	**198,667**

Table A-8. John Day external mark recapture data, 2003.

	Species	Location	Color	Release River	Release No.	No.	Collection
Elastomer Tags	Yearling Fall Chinook	Right	Green	Snake River	150,000	177	7,543
		Left	Blue	Snake River	150,000	120	4957
	Yearling Spring Chinook	Left	Orange	Grande Ronde and Yakima R.	45,282	28	1137
		Right	Orange	Yakima River	19,282	26	1167
		Right	Green	Yakima River	41,127	1	50
		Left	Red	Yakima River	125,374	5	229
		Right	Red	Yakima and Tucannon R.	273,682	356	19585
	Yearling Unknown Chinook	Left	Green	Clearwater, Grande Ronde, Yak. R.	364,574	158	7579
		Left	Red	Snake and Wallowa River	550,000	1,631	38985
	Summer Steelhead	Left	Green	Touchet and Wenatchee R.	47,869	84	7115
		Left	Red	Wenatchee River	112,943	29	2196
		Right	Green	Wenatchee and Tucannon R.	66,868	11	919
		Right	Orange	Wenatchee River	156,430	90	7012
		Right	Yellow	Methow River	105,890	54	4584
				Total Elastomer Tags =	**2,209,321**	**2,770**	**95515**

	Species	Location*	Code	Orient.	Release Site	Release No.	No.	Collection
Freeze Brands	Summer Steelhead	LA	2	2	Snake River (?)	20,000	3	193
		LA	IC	1	Grande Ronde River	40,000	2	134
		RA	2	2	Tucannon River (?)	20,000	1	67
					Total Freeze Brands =	**80,000**	**6**	**394**

* RA = right anterior, LA = left anterior, (?) Indicates uncertainty of release location

Table A-9. John Day external mark recapture data, 1985-present.

	Year	Yearling Chinook	Subyearling Chinook	Unclipped Steelhead[1]	Clipped Steelhead	Coho	Sockeye	Total
Elastomer Tags	1996	628						628
	1997	201			135			336
	1998	432			417			849
	1999[2]	5,280			777			6,057
	2000[2]	7,292			176			7,468
	2001[2]	1,889		30				1,919
	2002[2]	4,983		1,619	21			6,623
	2003[2]	2,502		268				2,770
Freeze Brands	1985	1,960	80		2,113	3	334	4,490
	1986	6,084	1,927		4,324	2	304	12,641
	1987	1,890	1,024		1,608	4	107	4,633
	1988	2,262	1,797		895	3	80	5,037
	1989	2,207	1,585		2,150	1	36	5,979
	1990	732	337		599	1	9	1,678
	1991	576	773		1,134		85	2,568
	1992[3]	1,420	945	66	546			2,977
	1993[3]	1,069	1,920	24	1,463		39	4,515
	1994	265	830		416			1,511
	1995	560	317		183			1,060
	1996	255	130		75	2		462
	1997				16			16
	1998				84			84
	1999				55			55
	2000				284			284
	2001				3			3
	2002				25			25
	2003				6			6

[1] Unclipped and clipped steelhead were not differentiated before 1992.
[2] Large increase due to research collection needs.
[3] Samples from gatewells 3B and 3C combined.

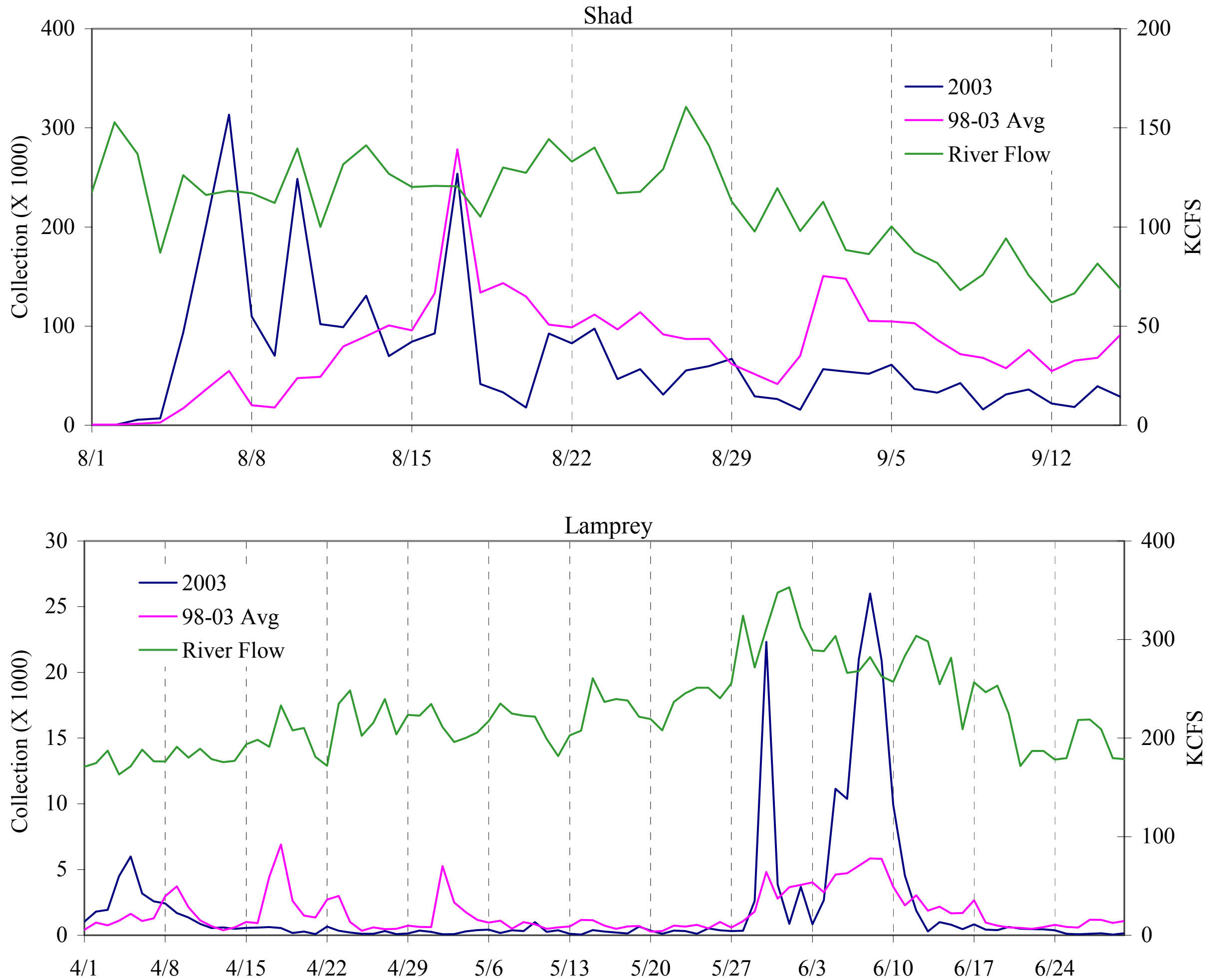


Figure A-7. John Day daily juvenile shad and lamprey passage, 2003, and the 98-03 averages.

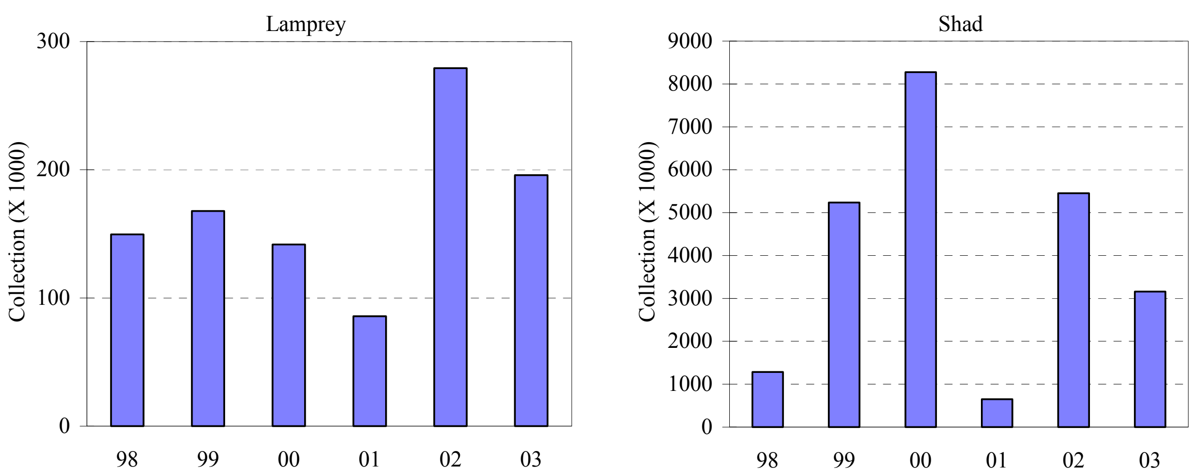


Figure A-8. John Day juvenile lamprey and shad collection totals, 1998-present.

Table A-10. John Day incidental collection summary, 1998-present.

Species	1998	1999	2000	2001	2002	2003
American shad (Adult)	276	939	174	628	657	957
American shad (Juvenile)	1,281,697	5,235,479	8,274,057	648,522	5,451,889	3,163,054
Bluegill/ Pumpkinseed	4,359	2,320	320	525	590	648
Bull trout					14	
Bullhead	975	213	231	260	429	261
Carp	1,743	319	40	8	139	8
Channel catfish	2,045	3,550	349	261	166	372
Chinook jack (12" to 22")					10	
Chinook minijack		149	7		10	8
Chiselmouth	196	2,050	1,452		60	
Crappie	1,802	281	266	59	438	580
Dace	60	62	65	253	11	92
Kokanee	166	517	19			23
Largemouth bass	168	297	66	450	28	72
Northern pikeminnow	187	236	5		121	67
Pacific lamprey (Adult)	1,012	493	467	586	928	4,030
Pacific lamprey (Brown)	30,256	33,500	3,363	435	8,164	2,507
Pacific lamprey (Silver)	119,227	134,356	138,298	85,281	271,138	191,876
Peamouth	310	117	5	12	83	403
Rainbow trout	326	32				24
Redside shiner		7		4		
Sand roller	298	138	263	149	8	
Sculpin	2,682	1,050	6,710	200,362	7,003	1,736
Smallmouth bass	7,554	1,586	1,821	3,422	4,441	4,183
Sucker	34,583	6,761	1,122	2,744	5,964	2,581
Threespine stickleback	4	30	3	4	150	8
Walleye	628	1,347	2,412	4,197	1,406	1,621
White sturgeon	209					
Whitefish	17,808	8,294	4,820	14,541	8,367	8,396
Yellow perch	201	799	362	978	3,763	3,497

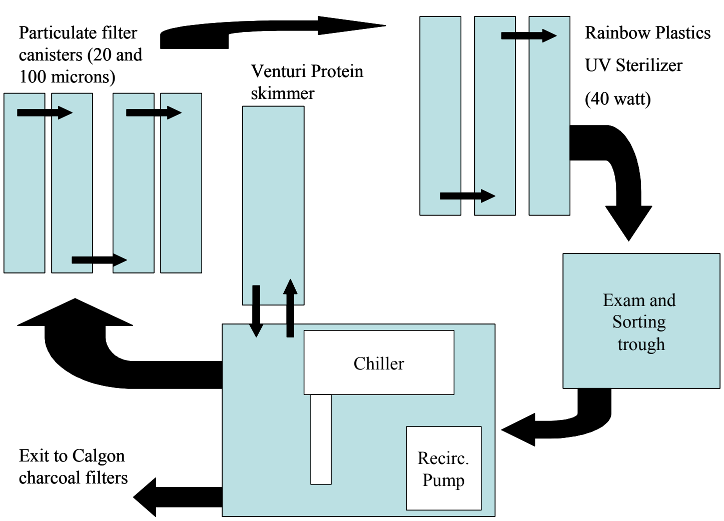


Figure A-9. John Day recirculation system (with filters).

Table A-11. John Day PDS dewatering summaries, 1998-present.

Date	Purpose/details	Adult Salmonids	Pacific Lamprey	Juvenile salmonids	Shad, cat-fish, other	Total
1998						
27-Jul-98	Scheduled inspection, Crest gate evaluation	69	100	30-50	138-258	337-477
23-Sep-98	PDS Adult holding investigation	130-140	50-100	200	22	402
29-Oct-98	End of season dewatering	164				164
1999						
2-Apr-99	PDS screen cleaner failure, switch gate repairs	2	20-30	50-60		72-92
9-Jun-99	Scheduled inspection, Crest gate malfunction	30-50				30-50
21-Sep-99	PDS Adult holding investigation	150-250	50-60		112	312-424
27-Oct-99	End of season dewatering	182	41		28	251
2000						
18-Sep-00	End of season dewatering	250	12	2	55	319
2001						
11-Jun-01	Scheduled inspection	45			255	300
23-Jul-01	Scheduled inspection	25			200	225
17-Sep-01	End of season dewatering	404			12	416
2002						
5-Oct-02	End of season dewatering	300	20		56	376
2003						
27-June-03	Scheduled inspection	75	25		608	708
15-Sep- 03	End of season dewatering	250	500		62	812

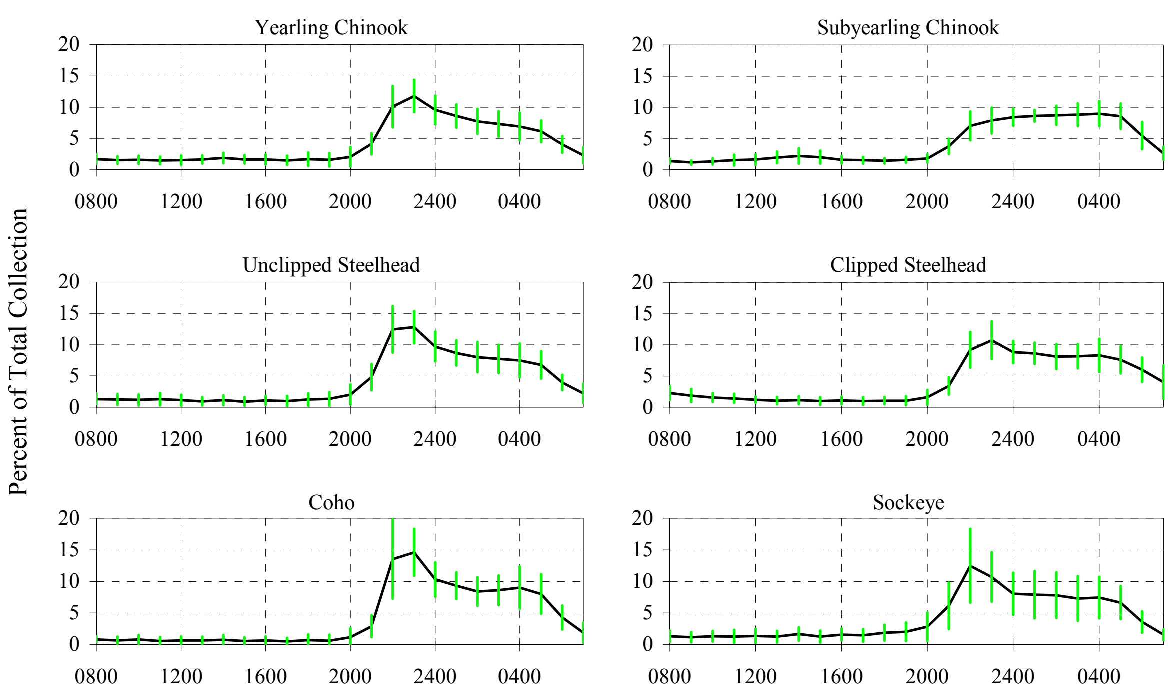


Figure A-10. John Day average diel passage with standard deviation, 1985-1997. Collection of hourly detail ceased in 1998 when sampling relocated to smolt monitoring facility.

Table A-12. John Day percent of total passage per hour, 1985-1997. Collection of hourly detail ceased in 1998 when sampling relocated to the smolt monitoring facility.

Yearling Chinook

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	1.6	1.5	1.5	1.4	1.3	1.6	1.8	1.7	1.6	1.5	1.7	1.6	2.1	4.4	10.5	11.9	9.6	8.7	7.7	7.2	6.8	6.1	4.0	2.4
MIN	0.6	0.5	0.8	0.7	0.8	0.7	0.8	0.7	0.8	0.6	0.7	0.6	0.7	2.4	5.5	8.5	5.2	4.7	4.2	4.0	3.2	3.2	2.5	0.7
MAX	3.2	2.8	2.9	2.5	3.2	2.6	3.3	2.9	3.6	3.3	4.0	3.8	5.5	8.4	15.3	17.4	13.9	10.8	10.4	9.5	9.5	8.3	7.2	4.2

Subyearling Chinook

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	1.4	1.2	1.3	1.7	1.6	1.8	1.9	1.7	1.4	1.4	1.3	1.5	1.7	3.9	7.4	7.5	8.1	8.6	8.9	8.8	9.3	8.9	5.9	2.7
MIN	0.8	0.7	0.8	0.7	0.7	0.6	0.7	0.7	0.8	0.7	0.8	1.0	0.9	2.3	3.3	4.4	6.6	7.1	6.1	6.3	6.0	6.0	3.1	1.1
MAX	2.0	1.9	2.4	3.3	3.7	3.6	4.7	4.0	2.7	2.7	2.1	2.2	3.2	5.7	12.1	12.1	11.4	10.1	11.6	12.4	12.9	12.8	9.4	4.1

Unclipped Steelhead

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	1.4	1.3	1.2	1.3	1.1	0.9	1.1	0.9	1.1	1.0	1.3	1.4	2.2	4.7	12.8	12.8	9.4	8.6	7.7	7.4	7.2	6.5	4.2	2.5
MIN	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.1	0.3	2.1	8.1	8.7	5.4	5.3	4.3	4.4	3.9	3.6	2.1	0.4
MAX	2.9	3.0	2.9	3.1	2.9	2.2	2.6	2.3	2.6	2.6	3.5	3.2	5.2	7.3	18.0	16.1	13.7	12.4	12.6	11.1	12.0	10.7	6.1	5.5

Clipped Steelhead

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	2.5	2.3	1.5	1.4	1.1	1.0	1.1	1.0	1.0	1.0	1.0	1.1	1.8	3.4	9.6	10.8	8.8	8.4	7.8	7.7	7.5	7.1	6.2	4.8
MIN	0.5	0.2	0.6	0.1	0.4	0.2	0.5	0.1	0.4	0.1	0.6	0.2	0.3	1.1	6.0	6.6	6.5	6.5	5.1	5.2	4.4	4.5	3.1	0.7
MAX	3.8	4.2	3.1	2.3	2.1	2.1	2.6	2.0	2.2	2.2	2.5	2.7	4.1	6.4	13.8	16.2	12.0	12.7	12.0	11.5	11.4	11.6	9.8	9.7

Coho

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	0.9	0.8	0.8	0.7	0.7	0.7	0.8	0.7	0.6	0.5	0.8	0.7	1.3	2.7	14.7	14.7	9.4	8.8	7.5	7.9	8.4	8.0	5.0	2.9
MIN	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.5	5.0	10.4	5.7	5.0	5.4	5.4	4.9	4.7	1.5	0.3
MAX	1.7	2.1	2.3	2.1	2.3	2.1	2.5	2.0	2.1	1.9	3.5	3.4	5.2	6.2	25.0	22.2	16.7	13.4	13.4	12.0	15.3	13.6	7.9	5.6

Sockeye

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	1.0	1.1	1.1	1.1	1.1	1.2	1.4	1.2	1.4	1.4	1.9	2.1	2.7	6.1	14.4	12.4	8.1	7.8	7.4	6.9	7.0	6.2	3.5	1.5
MIN	0.3	0.2	0.2	0.3	0.3	0.2	0.4	0.3	0.4	0.3	0.3	0.2	0.4	1.1	4.9	7.3	3.8	3.7	2.4	2.4	3.0	2.7	2.1	0.6
MAX	3.0	3.0	3.3	4.3	4.4	3.8	3.7	3.5	3.5	3.4	4.2	4.2	7.3	13.5	24.3	22.6	14.0	14.5	13.6	13.0	12.1	10.3	8.0	3.2

All Species Combined

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	1.8	1.6	1.5	1.7	1.5	1.8	1.8	1.6	1.5	1.4	1.5	1.6	2.1	4.5	10.3	10.8	9.5	9.4	9.1	8.9	9.0	8.5	5.8	3.1
MIN	0.8	0.6	0.8	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.9	0.9	1.0	2.5	5.8	6.7	6.8	6.6	5.8	5.7	4.7	4.6	3.2	0.8
MAX	2.3	2.1	2.2	2.6	2.7	2.9	2.8	2.5	2.3	2.2	2.5	2.6	3.7	5.7	12.0	13.3	10.8	9.8	10.5	11.1	11.3	10.8	8.0	4.9

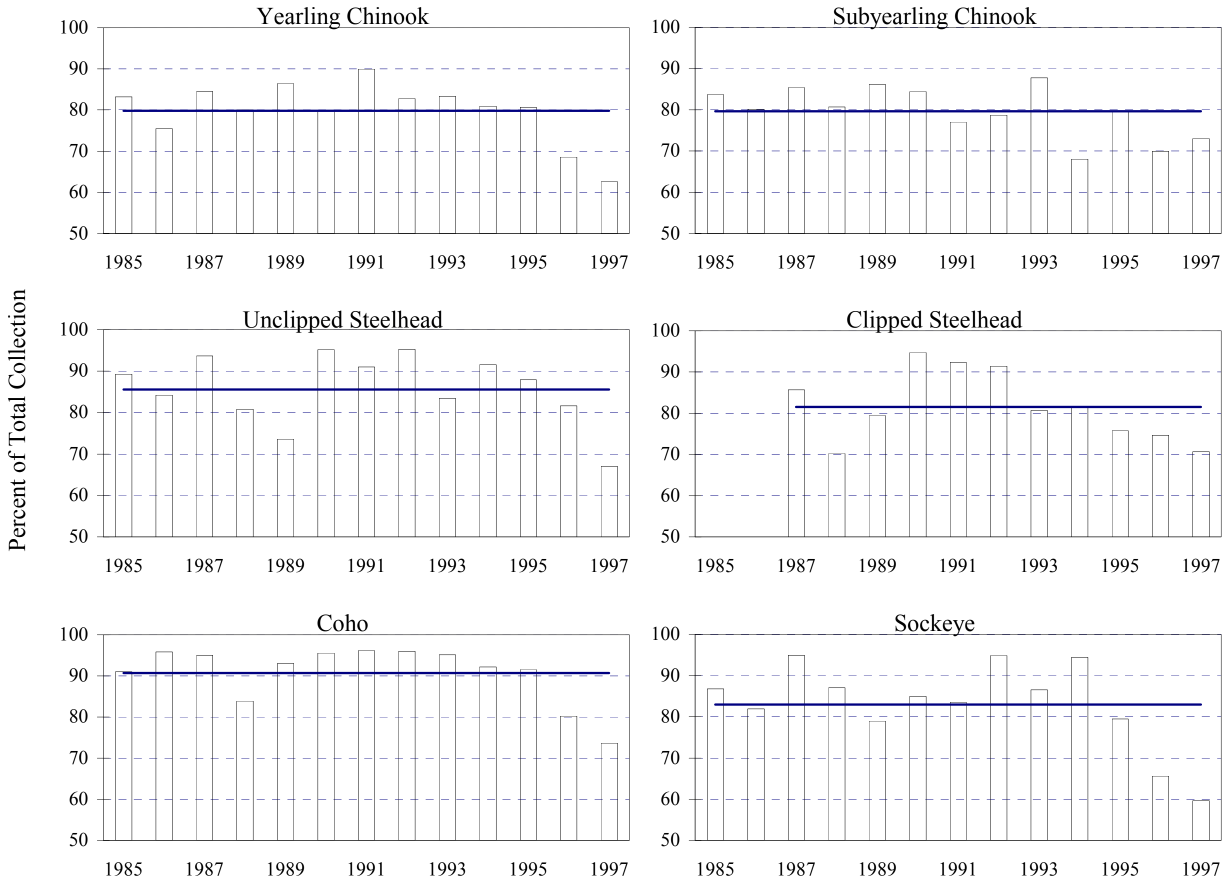


Figure A-11. John Day percent night passage (1800-0600 hours), 1985-1997, by species. Horizontal line is average for all years. Collection of hourly detail ceased in 1998 when sampling relocated to the smolt monitoring facility. Steelhead were not differentiated prior to 1987.

Table A-13. John Day percent night passage (1800-0600), 1985-1997. Collection of hourly detail ceased in 1998 when sampling relocated to smolt monitoring facility.

YEAR	Yearling Chinook	Subyearling Chinook	Unclipped Steelhead	Clipped Steelhead	Coho	Sockeye	All Species Combined
1985	83.2	83.7	89.3	N/A	91.0	86.8	68.1
1986	75.5	80.1	84.2	N/A	95.9	81.9	73.4
1987	84.5	85.4	93.6	85.6	95.0	94.9	82.2
1988	80.0	80.7	80.8	70.3	83.9	87.1	83.3
1989	86.4	86.2	73.6	79.4	93.0	79.0	86.0
1990	79.7	84.4	95.2	94.8	95.6	85.0	88.9
1991	89.9	77.0	91.0	92.3	96.2	83.6	87.7
1992	82.8	78.7	95.3	91.5	96.0	94.9	88.5
1993	83.3	87.8	83.4	80.7	95.1	86.5	83.3
1994	80.9	68.1	91.6	81.4	92.2	94.5	80.4
1995	80.7	79.7	87.9	75.8	91.5	79.5	89.4
1996	68.6	70.0	81.6	74.7	80.2	65.6	82.9
1997	62.6	73.1	67.0	70.6	73.7	59.6	86.4
AVERAGE	79.8	79.6	85.6	81.5	90.7	83.0	**83.1**
MIN	62.6	68.1	67.0	70.3	73.7	59.6	68.1
MAX	89.9	87.8	95.3	94.8	96.2	94.9	89.4

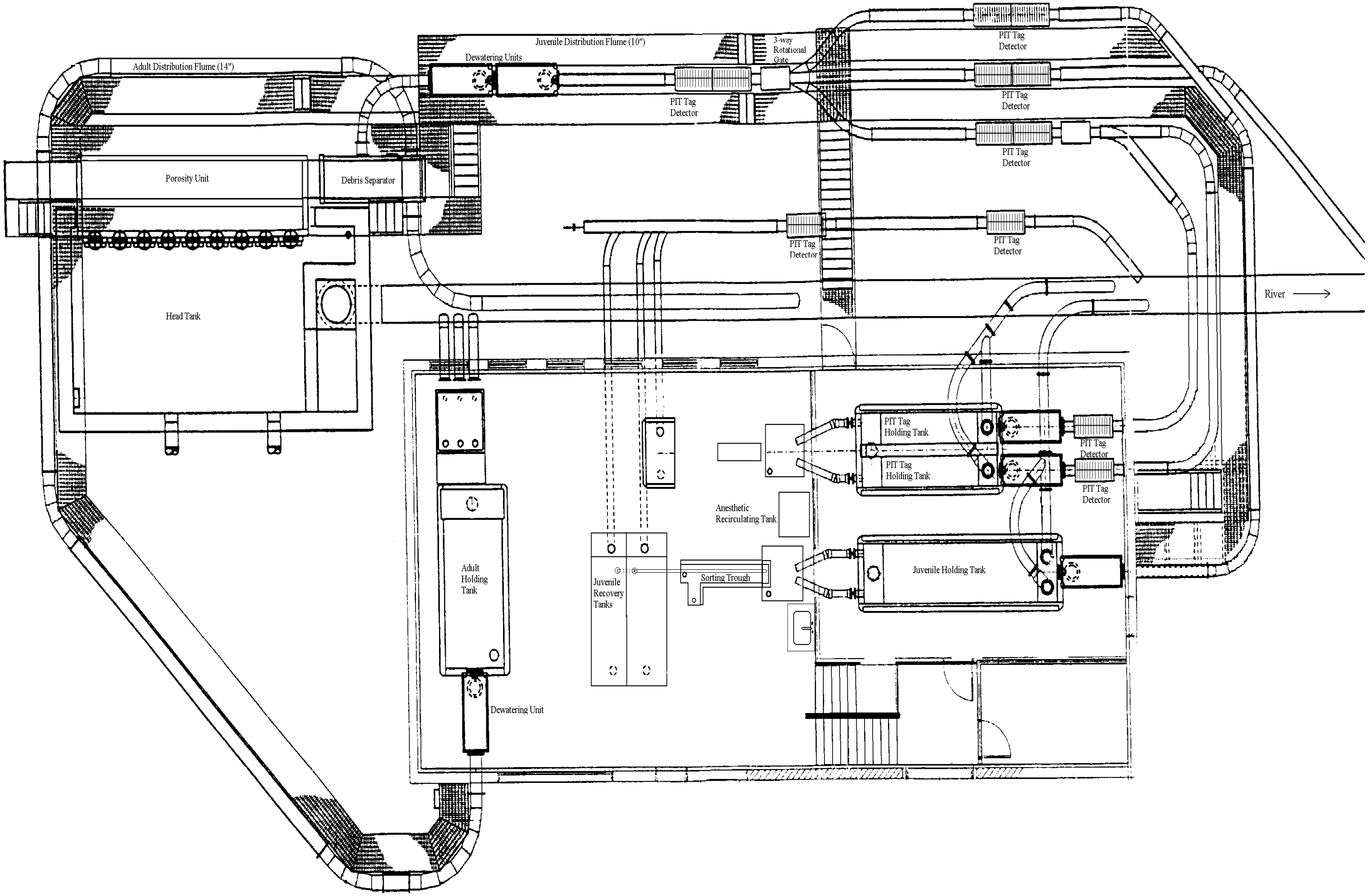


Figure A-12. John Day smolt monitoring facility laboratory layout, 1998-present.

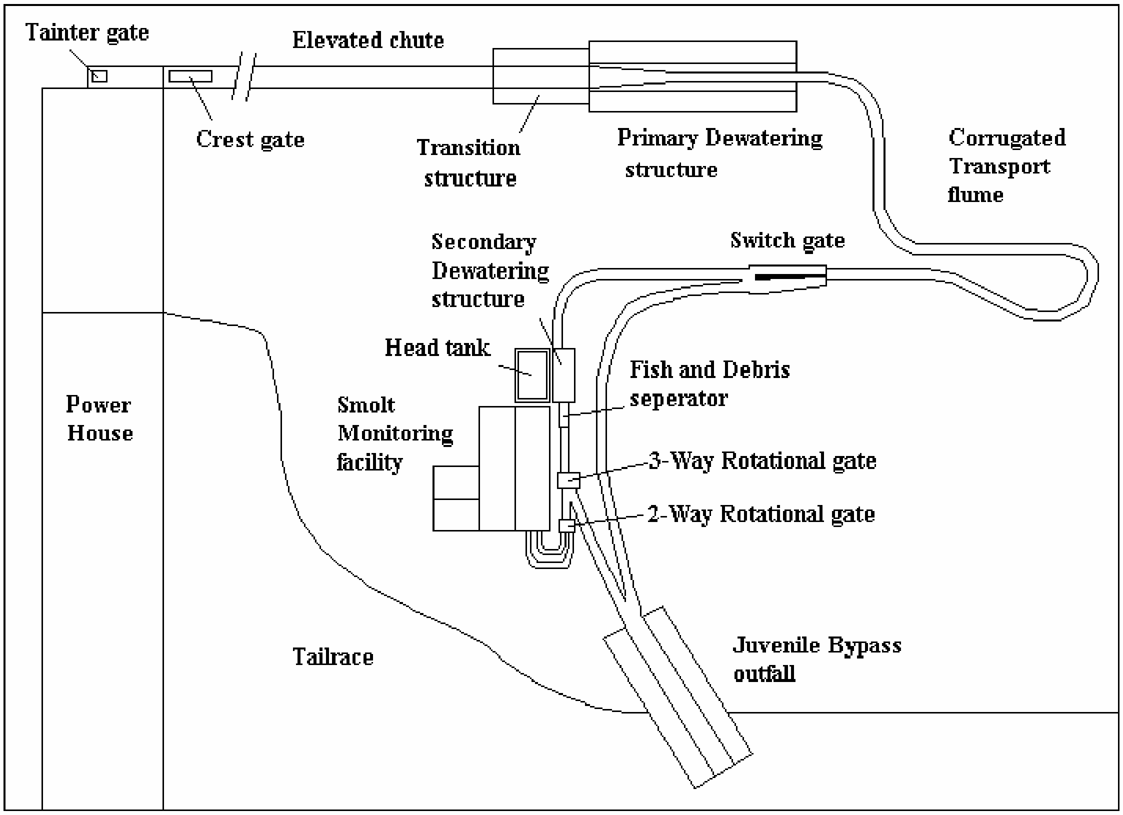


Figure A-13. John Day smolt monitoring facility "footprint", 1998-present.

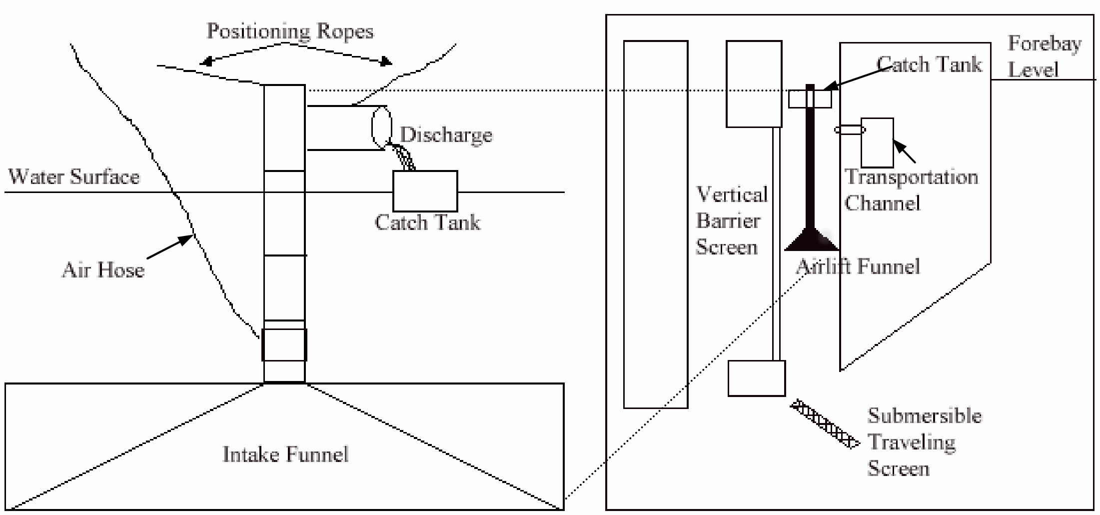


Figure A-14. John Day airlift sampling system, 1985-1997. Air was injected into the collar at the top of the funnel. This created a pressure differential and caused the water and fish inside the pipe to move up the pipe and dump into the suspended catch tank.

Table B-1. PH2 smolt monitoring program summary, 2000-present.

Year	Dates	Sampling Effort	Sub-Sampling	Sample Rate (%)	Yearling Chinook Sample #	Yearling Chinook Collection	Yearling Chinook Index	Subyearling Chinook Sample #[1]	Subyearling Chinook Fry	Subyearling Chinook Collection	Subyearling Chinook Fry	Subyearling Chinook Index	Coho Sample #	Coho Fry	Coho Collection	Coho Fry	Coho Index
2000	3/8-10/31	24 / 7	YES	.67-25	17,337	809,700	2,539,355	19,683	1,118	1,130,109	18,790	3,814,964	11,596	6	619,676	40	1,977,601
2001	3/13-10/31	24 / 7	YES	.67-25	21,304	1,320,763	1,687,846	57,366	530	2,348,968	16,099	2,940,643	24,093	27	1,496,057	530	2,164,025
2002	3/11-10/31	24 / 7	YES	.7-25	16,723	1,367,791	3,328,200	47,695	2,106	2,951,612	57,987	6,999,286	10,572	35	935,337	544	2,331,599
2003	3/11-10/31	24 / 7	YES	.7-25	20,927	1,616,876	4,043,774	40,478	1,069	3,477,847	17,548	7,903,920	8,764	20	861,351	286	2,116,570

Year	Dates	Sampling Effort	Sub-Sampling	Sample Rate (%)	Unclipped Steelhead Sample #	Unclipped Steelhead Collection	Unclipped Steelhead Index	Clipped Steelhead Sample #	Clipped Steelhead Collection	Clipped Steelhead Index	Sockeye Sample #	Sockeye Collection	Sockeye Index	Total Sample #	Total Collection	Total Index
2000[3]	3/8-10/31	24 / 7	YES	.67-25	2,208	89,961	277,538	2,839	121,745	380,008	407	19,717	65,491	54,070	2,790,908	9,054,957
2001	3/13-10/31	24 / 7	YES	.67-25	2672	167,593	223,406	3,024	198,581	265,991	1,161	74,953	106,967	109,620	5,606,915	7,388,877
2002	3/11-10/31	24 / 7	YES	.7-25	2856	222,554	572,070	4,334	340,024	882,934	3,372	335,999	848,201	85,552	6,153,317	14,962,288
2003	3/11-10/31	24 / 7	YES	.7-25	2655	207,685	518,389	4,514	446,730	1,116,794	3,349	487,186	1,261,374	80,687	7,097,675	16,960,822

[1] Includes fry numbers.

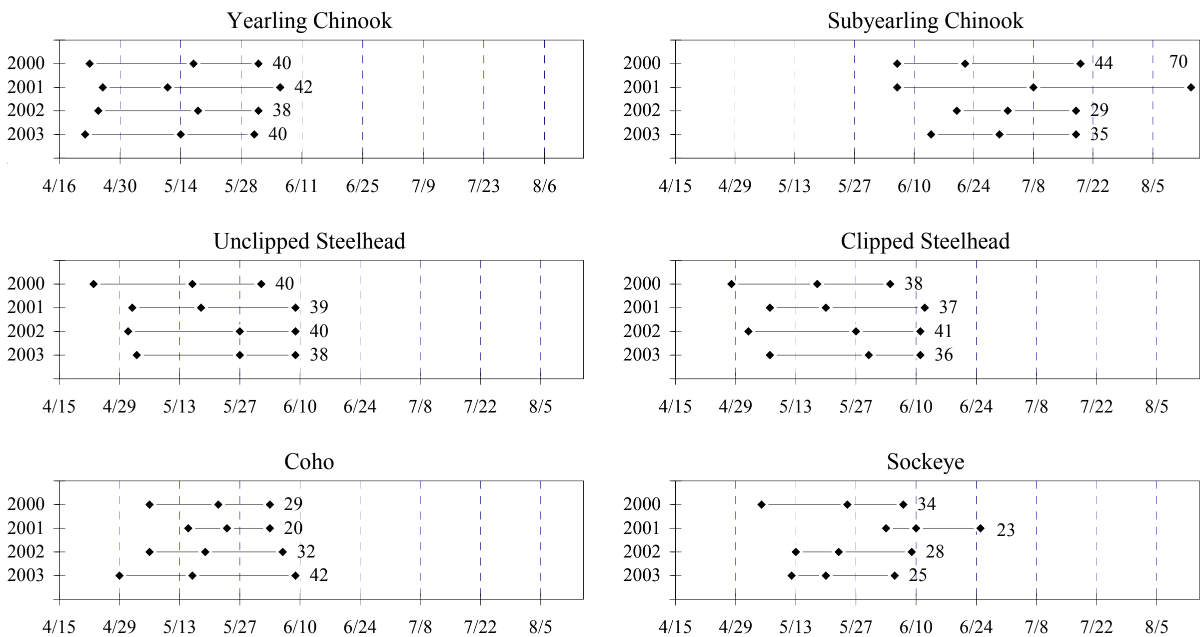


Figure B-1. PH2 10%, 50%, and 90% passage dates by species, 2000-present. The duration between 10-90% dates (in days) is indicated for each year.

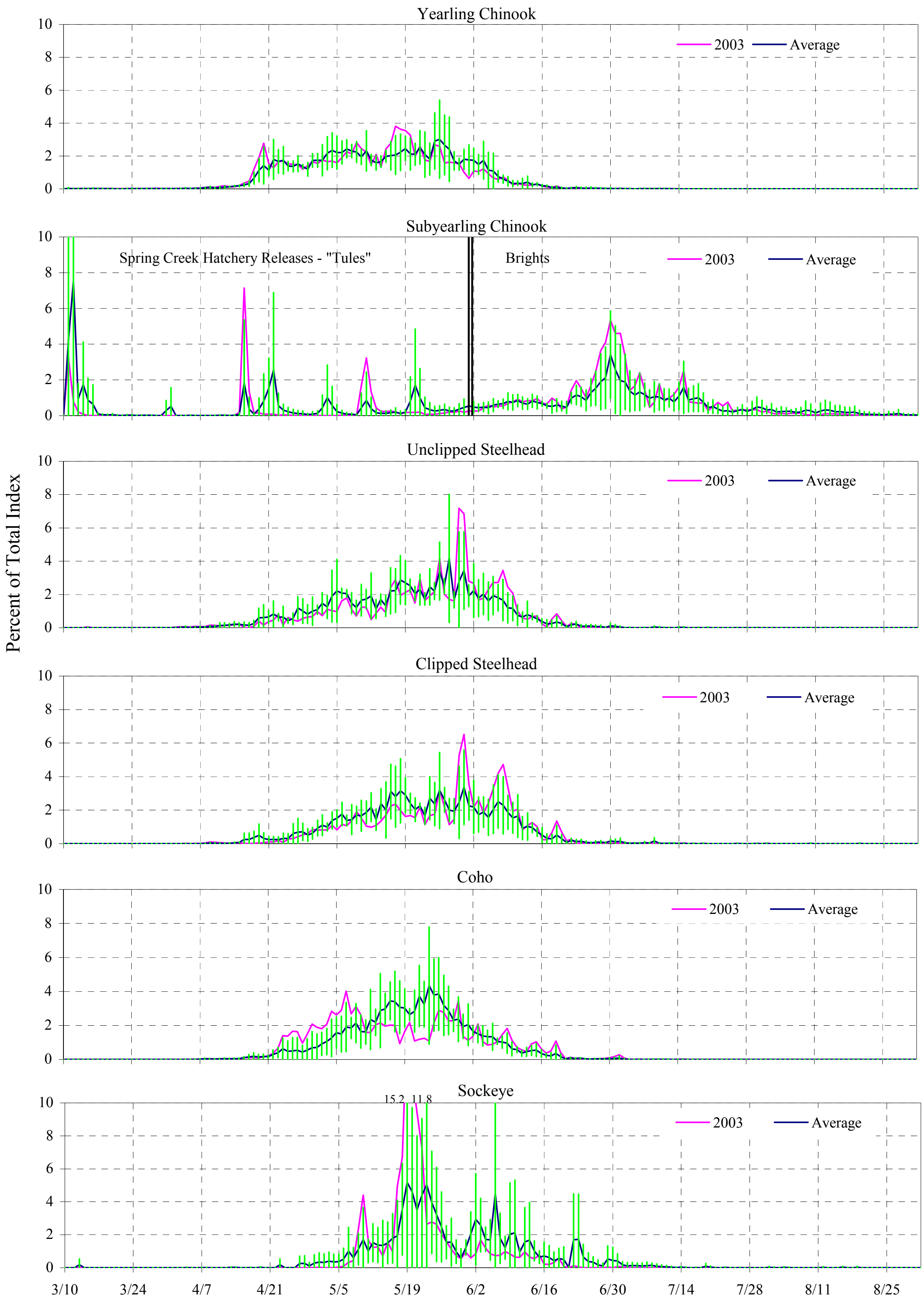


Figure B-2. PH2 daily passage for 2003 with the 2000-present average, and standard deviation.

Table B-2. PH2 10%, 50%, and 90% passage dates by species, 2000-present, with the duration of middle 80% in days.

Yearling Chinook				
	10 %	50%	90 %	# of Days
2000	23-Apr	17-May	1-Jun	40
2001	26-Apr	11-May	6-Jun	42
2002	25-Apr	18-May	1-Jun	38
2003	22-Apr	14-May	31-May	40
MEDIAN	24-Apr	15-May	01-Jun	39
MIN	22-Apr	11-May	31-May	38
MAX	26-Apr	18-May	06-Jun	42

Subyearling Chinook - "Brights" Only				
	10 %	50%	90 %	# of Days
2000	6-Jun	22-Jun	19-Jul	44
2001	7-Jun	9-Jul	15-Aug	70
2002	21-Jun	3-Jul	20-Jul	30
2003	15-Jun	1-Jul	19-Jul	35
MEDIAN	11-Jun	02-Jul	19-Jul	40
MIN	06-Jun	22-Jun	19-Jul	30
MAX	21-Jun	09-Jul	15-Aug	70

Unclipped Steelhead				
	10 %	50%	90 %	# of Days
2000	23-Apr	16-May	1-Jun	40
2001	2-May	18-May	9-Jun	39
2002	1-May	27-May	9-Jun	40
2003	3-May	27-May	9-Jun	38
MEDIAN	01-May	22-May	09-Jun	40
MIN	23-Apr	16-May	01-Jun	38
MAX	03-May	27-May	09-Jun	40

Clipped Steelhead				
	10 %	50%	90 %	# of Days
2000	28-Apr	18-May	4-Jun	38
2001	7-May	20-May	12-Jun	37
2002	2-May	27-May	11-Jun	41
2003	7-May	30-May	11-Jun	36
MEDIAN	04-May	23-May	11-Jun	39
MIN	28-Apr	18-May	04-Jun	36
MAX	07-May	30-May	12-Jun	41

Coho				
	10 %	50%	90 %	# of Days
2000	6-May	22-May	3-Jun	29
2001	15-May	24-May	3-Jun	20
2002	6-May	19-May	6-Jun	32
2003	29-Apr	16-May	9-Jun	42
MEDIAN	06-May	20-May	04-Jun	31
MIN	29-Apr	16-May	03-Jun	20
MAX	15-May	24-May	09-Jun	42

Sockeye (Wild + Hatchery)				
	10 %	50%	90 %	# of Days
2000	5-May	25-May	7-Jun	34
2001	3-Jun	10-Jun	25-Jun	23
2002	13-May	23-May	9-Jun	28
2003	12-May	20-May	5-Jun	25
MEDIAN	12-May	24-May	08-Jun	28
MIN	05-May	20-May	05-Jun	23
MAX	03-Jun	10-Jun	25-Jun	34

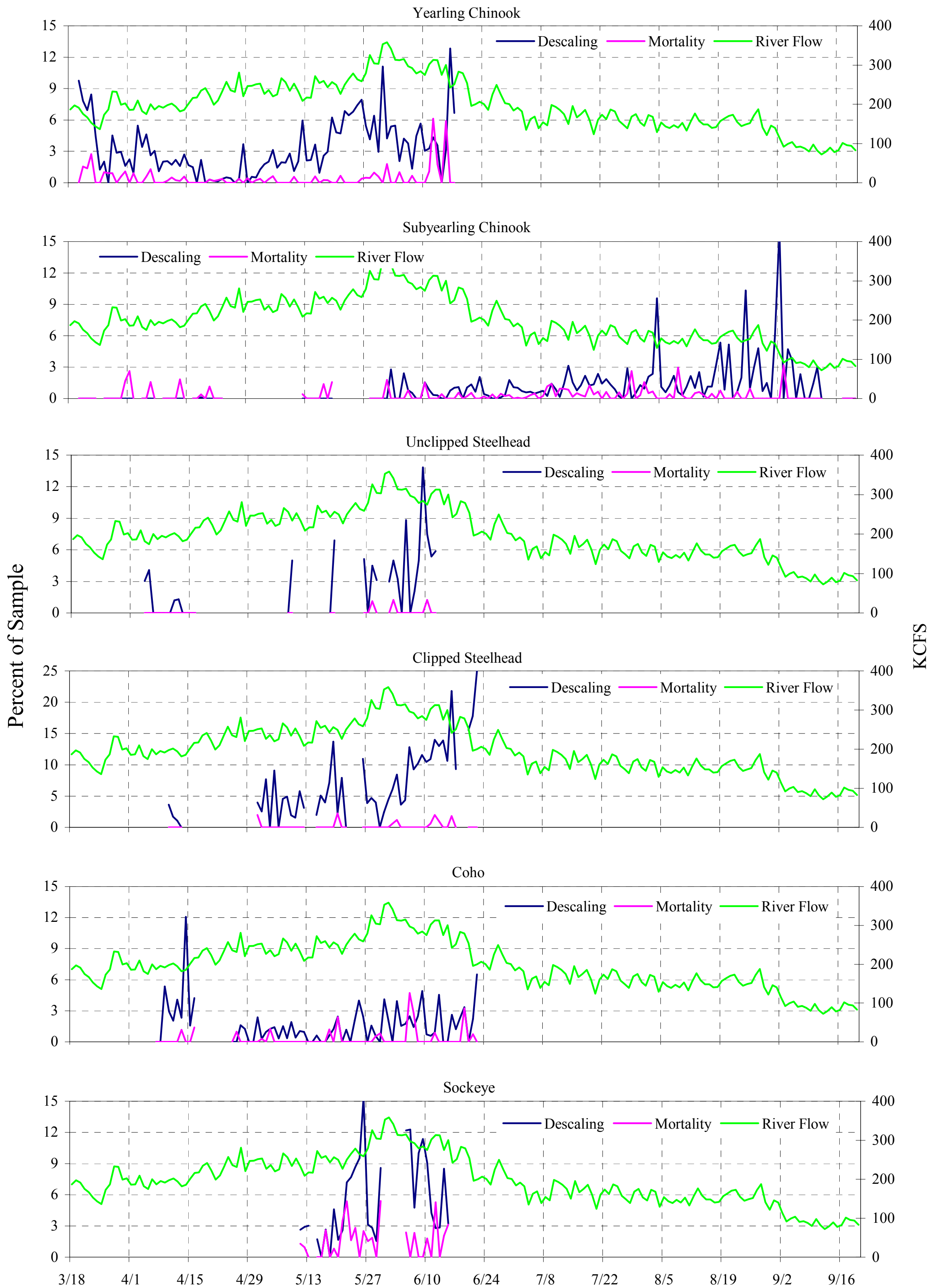


Figure B-3. PH2 daily percent descaling, mortality, and river flow for 2003. Days with sample size less than 30 were excluded. **Note percent of sample scale difference for clipped steelhead**.

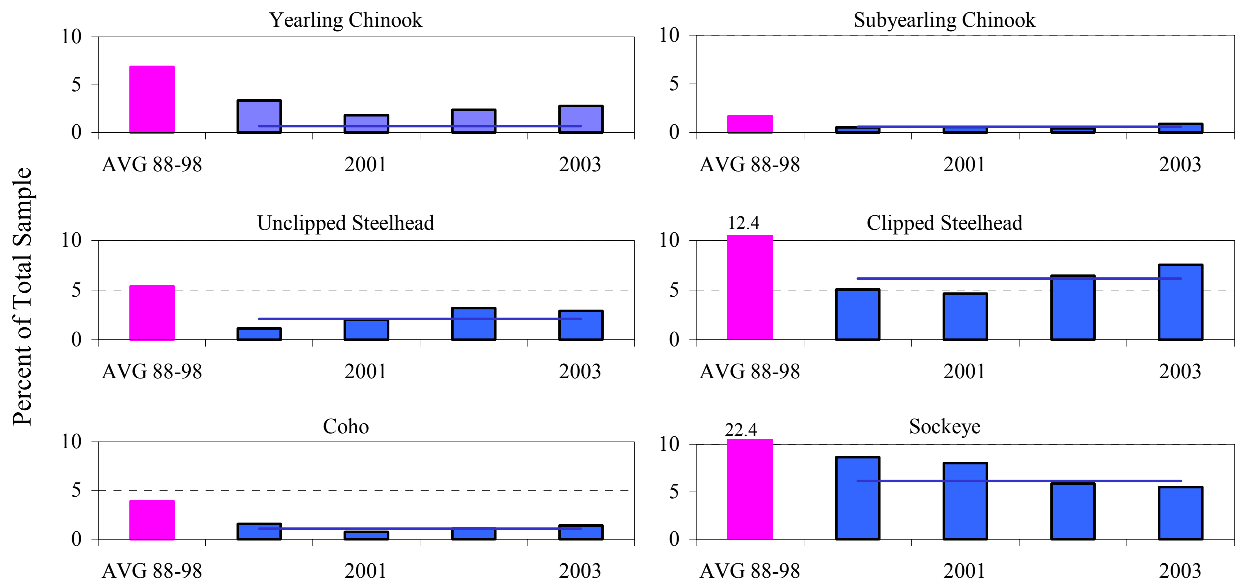


Figure B-4. PH2 annual descaling rates at the JMF (2000-present), with the average line, compared to the average from the original sampling system.

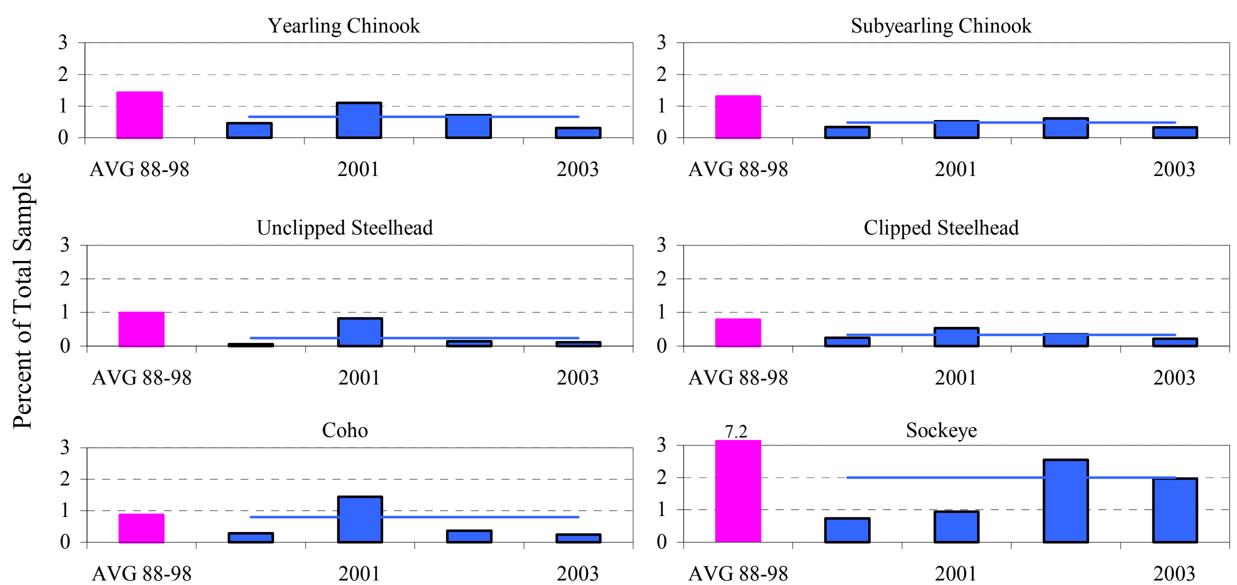


Figure B-5. PH2 annual mortality rates at the JMF (2000-present), with the average line, compared to the average from the original sampling system.

Table B-3. PH2 annual descaling and mortality data, 2000-present, and the average, minimum, and maximum from the original sampling system.

		YEARLING CHINOOK					SUBYEARLING CHINOOK				
	YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
AVG	1988-1998	6,083	410	6.8	87	1.4	9,133	150	1.7	119	1.3
MIN		358	36	10.1	2	0.6	1,461	42	2.9	6	0.4
MAX		18,372	1,854	10.4	478	2.6	20,469	373	1.9	390	1.9
JMF	2000	17,337	576	3.3	80	0.5	19,683	101	0.5	68	0.3
	2001	21,304	384	1.8	236	1.1	57,366	325	0.6	300	0.5
	2002	16,723	397	2.4	119	0.7	47,695	201	0.4	293	0.6
	2003	20,927	577	2.8	65	0.3	40,478	361	0.9	136	0.3
JMF Average		19,073	484	2.6	125	0.7	41,306	247	0.6	199	0.5

		UNCLIPPED STEELHEAD					CLIPPED STEELHEAD				
	YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
AVG	1988-1998	535	28	5.4	5	1.0	623	77	12.4	5	0.8
MIN		3	0	0.0	0	0.0	4	0	0.0	0	0.0
MAX		2,049	91	4.5	31	1.5	1,630	324	20.1	18	1.1
JMF	2000	5,047	57	1.1	3	0.1	2,839	143	5.0	7	0.2
	2001	2,672	53	2.0	22	0.8	3,024	140	4.7	16	0.5
	2002	2,856	91	3.2	4	0.1	4,334	279	6.5	15	0.3
	2003	2,655	77	2.9	3	0.1	4,514	340	7.5	10	0.2
JMF Average		3,308	70	2.1	8	0.2	3,678	226	6.2	12	0.3

		COHO					SOCKEYE				
	YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
AVG	1988-1998	4,034	156	3.9	35	0.9	732	152	22.4	53	7.2
MIN		119	9	7.6	1	0.8	1	1	100.0	0	0.0
MAX		9,192	476	5.3	207	2.3	2,592	766	35.8	451	17.4
JMF	2000	11,596	182	1.6	33	0.3	407	35	8.7	3	0.7
	2001	24,093	176	0.7	348	1.4	1,161	92	8.0	11	0.9
	2002	10,572	114	1.1	38	0.4	3,372	192	5.8	86	2.6
	2003	8,764	123	1.4	21	0.2	3,349	180	5.5	66	2.0
JMF Average		13,756	149	1.1	110	0.8	2,072	125	6.1	42	2.0

Table B-4. PH2 annual condition subsampling data, 2000-present, as a percent of total sample.

YEAR	n	3-19% DESC	INJURY					DISEASE				PREDATION	
			HD	OP	PE	BD	HM	PAR	COL	FUN	BKD	BIRD	OT
Yearling Chinook													
2000	3,375	18.3	0.1	0.5	0.1	0.8	0.0	0.3	0.0	0.7	0.2	1.5	0.0
2001	4,368	14.5	0.3	0.6	0.0	0.7	0.2	0.3	0.0	4.1	0.8	1.8	0.0
2002	3,196	15.7	0.2	0.7	0.1	0.5	0.0	0.3	0.0	0.5	0.1	1.7	0.0
2003	4,693	15.3	0.1	0.7	0.2	0.9	0.6	0.4	0.0	2.9	0.2	3.0	0.1
Subyearling Chinook													
2000	3,310	10.8	0.1	0.3	0.1	0.5	0.2	0.3	0.0	0.3	0.1	0.4	0.1
2001	11,579	8.6	0.1	0.4	0.0	0.6	0.1	0.2	0.0	0.1	0.0	0.3	0.2
2002	6,037	5.0	0.1	0.5	0.0	0.5	0.1	0.3	0.0	0.1	0.0	0.2	0.1
2003	8,077	6.7	0.0	0.3	0.0	0.7	0.2	0.0	0.0	0.1	0.0	0.2	0.3
Unclipped Steelhead													
2000	868	19.4	0.5	0.2	0.0	0.5	0.0	5.9	0.0	0.3	0.1	2.9	0.0
2001	1,051	15.1	0.0	1.0	0.1	0.7	0.1	11.8	0.0	0.4	0.0	3.3	0.2
2002	1,300	19.1	0.5	1.7	0.0	0.9	0.0	5.4	0.0	1.0	0.0	5.2	0.1
2003	1,197	18.4	0.0	1.5	0.1	1.3	0.3	5.6	0.0	0.7	0.0	4.8	0.1
Clipped Steelhead													
2000	1,152	33.5	0.3	4.3	0.0	1.0	0.0	0.1	0.0	1.1	0.0	10.9	0.1
2001	1,189	33.1	0.4	2.8	0.1	1.0	0.1	0.3	0.0	0.5	0.0	8.2	0.1
2002	1,975	33.0	0.4	3.5	0.1	1.2	0.0	2.2	0.0	1.3	0.0	10.8	0.1
2003	1,839	30.8	0.4	3.6	0.5	1.8	0.3	0.9	0.0	1.1	0.0	11.0	0.2
Coho													
2000	2,788	10.7	0.1	0.2	0.0	0.4	0.0	0.1	0.0	0.9	0.0	0.9	0.1
2001	2,136	11.0	0.2	0.5	0.0	0.6	0.1	0.1	0.0	0.9	0.0	0.9	0.0
2002	2,731	11.4	0.3	0.2	0.0	0.4	0.0	0.1	0.0	1.0	0.0	1.0	0.1
2003	2,864	7.4	0.0	0.2	0.4	0.5	0.1	0.2	0.0	1.0	0.0	1.1	0.0
Sockeye													
2000	192	34.4	0.0	1.6	0.5	0.5	1.0	0.0	0.0	0.0	0.0	0.5	0.0
2001	422	36.0	0.5	2.1	0.0	0.5	0.2	0.2	0.0	0.2	0.0	0.5	0.2
2002	1,358	30.0	0.3	2.0	0.0	0.7	0.0	0.0	0.0	0.9	0.0	0.4	0.2
2003	1,156	21.8	0.2	1.8	0.3	0.0	0.4	0.0	0.0	0.2	0.0	0.1	0.2

HD- Head Injury; OP - Opercula Injury; PE - Pop Eye; BD - Body Injury; and HM - Hemorrhage. PAR - Parasites; COL - Columnaris; FUN - Fungus; and BKD - Bacterial Kidney Disease symptoms. BIRD - Bird strikes; OT - Other predators.

Table B-5. Bonneville PIT tag summary, 2003.

Migration Year	Site	Chinook										
		Hatchery				Unknown			Wild			
		FA	SP	SU	UN	FA	SP	UN	FA	SP	SU	UN
2000	B2J											
	B1J		1				1					
2000 Total			**1**				**1**					
2001	B2J											
	B1J											1
2001 Total												**1**
2002	B2J	278	2			2		4		218	3	17
	B1J	11	1					1		18	1	1
2002 Total		**289**	**3**			**2**		**5**		**236**	**4**	**18**
2003	B2J	10,378	51,395	18,985	1202	164		35	91	3,458	1,205	4,269
	B1J	400	4,262	1,562	123	23			5	255	94	395
2003 Total		**10,778**	**55,657**	**20,547**	**1325**	**187**		**35**	**96**	**3,713**	**1,299**	**4,664**
Season Total	B2J	10,656	51,397	18,985	1,202	166		39	91	3,676	1,208	4,286
	B1J	411	4,264	1,562	123	23	1	1	5	273	95	397
	Totals	**11,067**	**55,661**	**20,547**	**1,325**	**189**	**1**	**40**	**96**	**3,949**	**1,303**	**4,683**

Migration Year	Site	Coho					Sockeye		Steelhead			Unknown		Totals
		Hatchery		Unknown		Wild	Hatchery	Wild	Hatchery	Wild		Unknown	Wild	
		FA	UN	FA	UN	UN	SU	SU	SU	SU	UN	UN	UN	
2000	B2J									4				4
	B1J									1				3
2000 Total										**5**				**7**
2001	B2J	1								19				20
	B1J									1				2
2001 Total		**1**								**20**				**22**
2002	B2J								11	158	57			750
	B1J								3	13	2			51
2002 Total									**14**	**171**	**59**			**801**
2003	B2J	2,821	292	121	72	9	211	49	39,943	3,624	230	8	1	138,563
	B1J	113	8	9	3	1	7	1	3,683	219	19	1		11,183
2003 Total		**2,934**	**300**	**130**	**75**	**10**	**218**	**50**	**43,626**	**3,843**	**249**	**9**	**1**	**149,746**
Season Total	B2J	2,822	292	121	72	9	211	49	39,954	3,805	287	8	1	139,337
	B1J	113	8	9	3	1	7	1	3,686	234	21	1		11,239
	Totals	**2,935**	**300**	**130**	**75**	**10**	**218**	**50**	**43,640**	**4,039**	**308**	**9**	**1**	**150,576**

Table B-6. Bonneville annual PIT tag detection totals, 1992-present.

Species	Run	Rearing Type	1992 - 1995[1] Average	1996[2]	1997[3]	1998	1999	2000	2001	2002	2003
Chinook	Spring	Hatchery	9.3	831	2,323	7,563	25,971	12,827	12,724	49,585	55,661
		Wild	8.0	60	127	832	12,860	2,495	1,803	2,038	3,949
		Unknown	1.0					18,041	1,847	3,243	1
	Summer	Hatchery	6.3	273	1,199	2,364	3,205	5,426	18,309	9,569	20,547
		Wild	2.0	43	75	604	2,114	1,553	1,363	934	1,303
		Unknown				1				11	
	Fall	Hatchery	5.3	140	1,608	5,024	3,934	2,064	2,443	11,645	11,067
		Wild	1.8	2	117	79	230	58	142	61	96
		Unknown	<1		7,127	3,891	24,167	6,693	3,421	3,673	189
	Unknown	Hatchery	39.3	1,057	161	5,018	14,124	4,277	2,292	4,748	1,325
		Wild	17.0	180	2	1,033	2,846	5,445	247	2,820	4,683
		Unknown	5.0	223	78	1,883	3,102	192	105	150	40
Chinook Total			124.3	2,809	12,817	28,292	92,553	59,071	44,696	88,477	98,861
Steelhead	Spring	Hatchery		18			1				
		Wild					188				
	Summer	Hatchery	17.8	1,454	7,242	4,747	28,118	9,312	1,509	4,162	43,640
		Wild	3.0	200	423	1,482	3,136	7,934	653	4,528	4,039
		Unknown	<1	2	8	5	1			63	
	Fall	Unknown								1	
	Unknown	Hatchery				9					
		Wild									308
Steelhead Total			23.5	1,674	7,673	6,243	31,444	17,246	2,162	8,755	47,987
Coho	Spring	Hatchery			102		1	9			
		Unknown					5,040	9,010			
	Summer	Unknown				1					
	Fall	Hatchery		13	76	269	1,333	698	390	2,819	2,935
		Wild						12	4		
		Unknown				68	246	1	109	62	130
	Unknown	Hatchery				117	2			213	300
		Wild									10
		Unknown			4,789	7,796				158	75
Coho Total				13	4,967	8,251	6,622	9,730	503	3,252	3450
Sockeye	Spring	Hatchery	1.5								
	Summer	Hatchery		11	5	161	101	81	12	84	218
		Wild		2	1	12	10	7	2	40	50
		Unknown						635			
	Unknown	Hatchery	<1	23	11	12	20	2	5	9	
		Wild	2.3	16	33	158	248	20	125	117	
		Unknown				2		21			
Sockeye Total			4.5	52	50	345	379	766	144	250	268
Unknown	Unknown	Wild									1
		Unknown						29		92	9
Unknown Total								29		92	10
TOTALS (all detections combined) =			**153.8**	**4,548**	**25,507**	**43,131**	**130,998**	**86,842**	**47,505**	**100,826**	**150,576**

[1] Prior to 1996, PIT tag detections were hand scanned from sampled fish.
[2] Beginning in 1996, all PH1 flat plate detections added.
[3] Beginning in 1997, all PH2 full bypass detections added.

Table B-7. PH2 external mark recapture data, 2003.

	Species	Location	Color	Release River	Release No.	No.	Collection Est.
Elastomer Tags	Yearling Fall	Right	Green	Snake River	150,000	30	4,100
		Left	Blue	Snake River	150,000	13	1,700
	Yearling Spring Chinook	Left	Orange	Grande Ronde and Yakima R.	45,282	4	500
		Left	Red	Yakima River	125,372	4	500
		Right	Orange	Yakima River	19,282	11	1,293
		Right	Red	Yakima and Tucannon R.	273,682	58	7,100
	Yearling Unknown Chinook	Left	Green, AD and NC	Clearwater, Grande Ronde, Yak. R.	364,574	25	3,143
		Left	Red	Snake and Wallowa Rivers	550,000	216	22,429
	Summer Steelhead	Left	Green	Wenatchee River, Touchet River	47,869	48	5,414
		Left	Red	Wenatchee River	112,943	21	2,418
		Left	Orange	Wenatchee River	156,430	3	600
		Right	Green	Wenatchee and Toucannon	66,868	42	4,778
		Right	Orange	Wenatchee River	156,430	48	4,295
				Total Elastomer Tags =	**2,218,732**	**523**	**58,270**

	Species	Location*	Code	Orientation	Release River	Release Number	Number Recaptured	Collection Estimate
Freeze Brands	Summer Steelhead	LA	2	2	Snake River	20,000	2	200
		LA	IC	1	Grande Ronde	40,000	1	243
		RA	2	3	Snake River	20,000	1	200
					Total Freeze Brands =	**80,000**	**4**	**643**

* RA = right anterior, LA = left anterior

Table B-8. Bonneville external mark recapture data, 1988-present.

		Yearling Chinook		Subyearling Chinook		Unclipped Steelhead[1]		Clipped Steelhead		Coho		Sockeye		Total		Grand Total
	Year	PH1	PH2	PH1	PH2	PH1	PH2	PH1	PH2	PH1	PH2	PH1	PH2	PH1	PH2	
Elastomer Tags	1997	183	47					169	12					352	59	411
	1998	58	38					161	4					219	42	261
	1999	156						29						185	0	185
	2000	71	278					14	29					85	307	392
	2001	4	263						68					4	331	335
	2002	28	388			35	429							63	817	880
	2003	30	361			11	162							41	523	564
Freeze Brands	1988	425	56	165	2			157	8	2	1	55	4	804	71	875
	1989	521	247	364	24			443	51			16	4	1344	326	1670
	1990	286	23	189	27			218	9			6		699	59	758
	1991	258	71	235	5			204	32	2		48	11	747	119	866
	1992	220		212		18		40						490	0	490
	1993	349	42	360	10	6		57	4			19	3	791	59	850
	1994	55	7	187	20			27						269	27	296
	1995	181		147				77						405	0	405
	1996	55	36	44	12			59	4	1				159	52	211
	1997							30	2					30	2	32
	1998							7	1					7	1	8
	1999							1						1	0	1
	2000								11					0	11	11
	2001													0	0	0
	2002								6					0	6	6
	2003					1	4							1	4	5

[1] Unclipped and clipped steelhead were not differentiated before 1992.

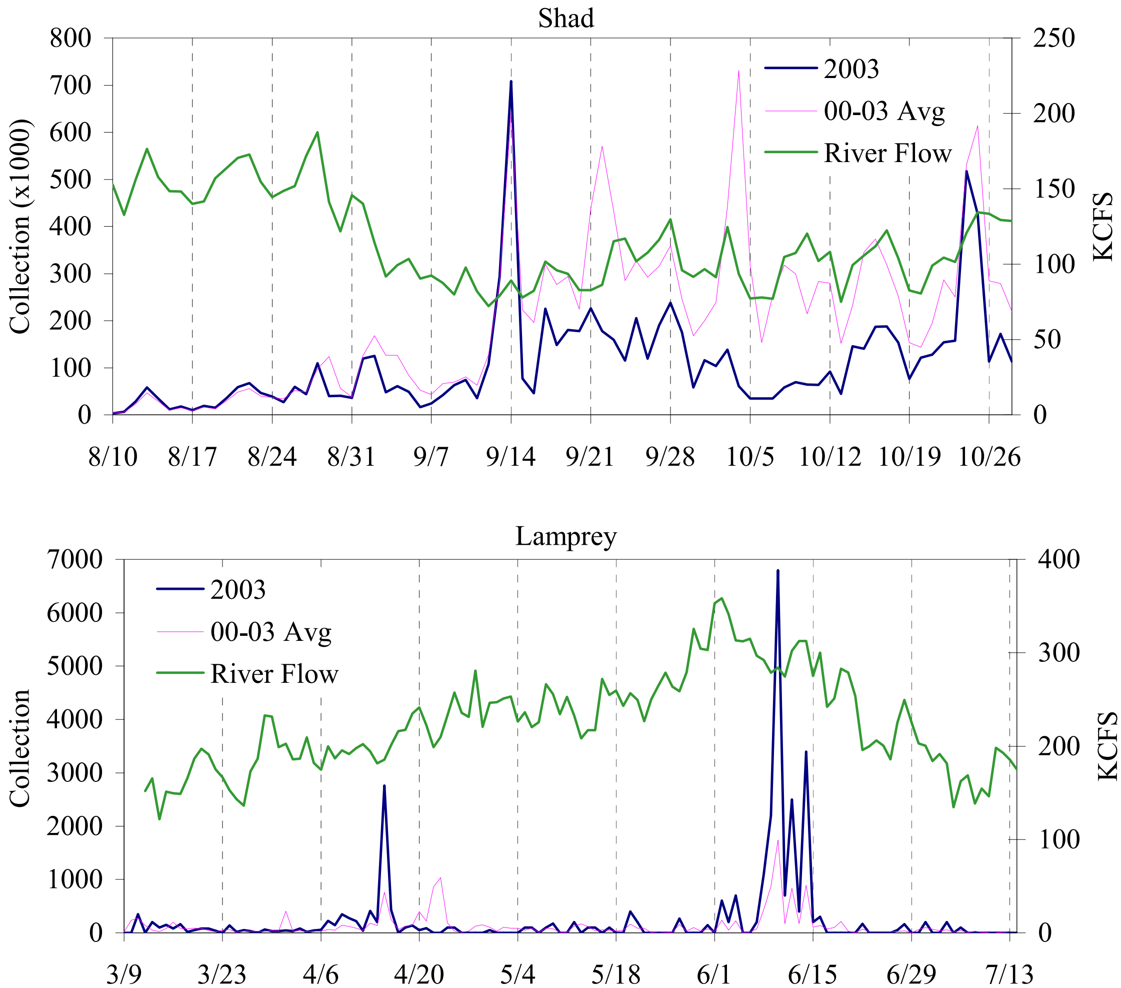


Figure B-6. PH2 daily juvenile shad and lamprey passage, 2003.

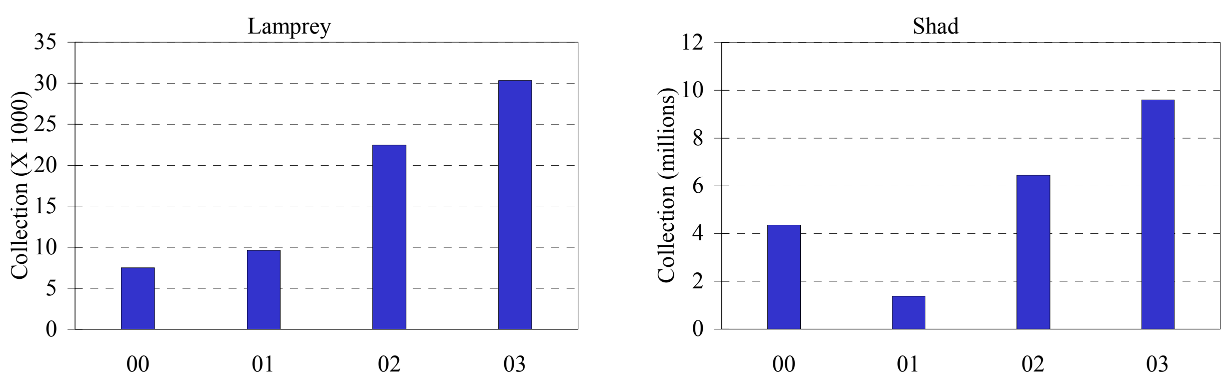
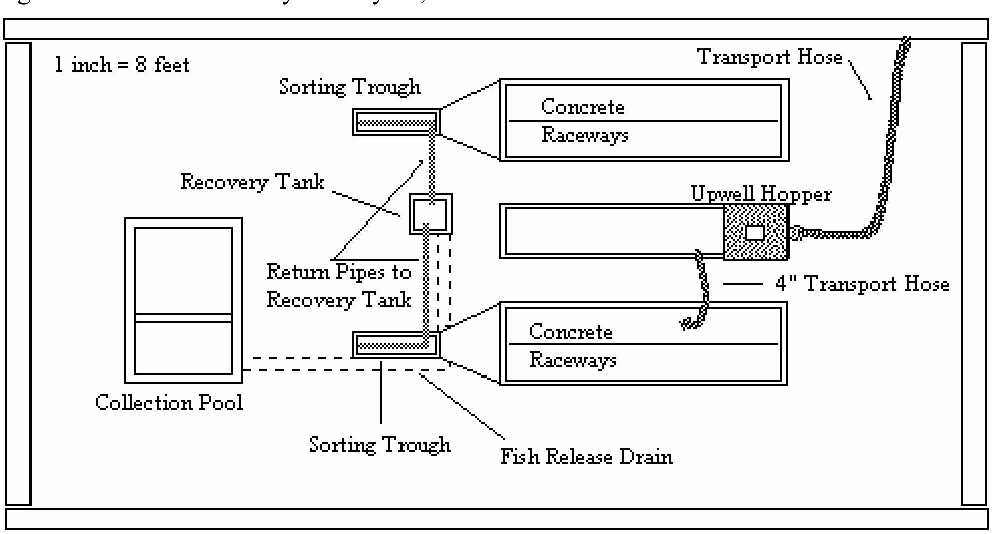


Figure B-7. PH2 juvenile lamprey and shad collection totals, 2000-present.

Table B-9. PH2 incidental collection summary, 2000-present.

Species	2000	2001	2002	2003
American shad (Adult)	930	1,385	11,192	11,708
American shad (Juvenile)	4,359,372	1,376,845	6,444,156	9,603,401
Bluegill/ Pumpkinseed	306	168	174	330
Bullhead	29	17	8	
Carp	472	98	27	200
Channel catfish	5			
Chinook jack - Hatchery			100	
Chinook jack (12" to 22")	75		19	135
Chinook minijack	10			
Chiselmouth			8	
Crappie	10	4	24	25
Cutthroat trout	69			4
Kokanee	134	12	68	112
Largemouth bass	255	28	52	164
Northern pikeminnow	356	1,282	983	619
Pacific lamprey (Adult)	39	100	192	608
Pacific lamprey (Brown)	138	245	283	183
Pacific lamprey (Silver)	7,361	9,390	22,160	30,150
Peamouth	3,416	8,972	3,250	8,918
Rainbow trout	277	58	14	33
Redside shiner	10	106	4	33
Sand roller		4		25
Sculpin	454	99,853	3,077	1,751
Smallmouth bass	109	180	166	489
Sucker	56	91	126	45
Tench	20	40		
Threespine stickleback	319	71,718	95,689	997
Walleye		16		
White sturgeon	68			10
Whitefish	29	276	142	35
Yellow perch			20	

Figure B-8. PH2 laboratory area layout, 1986-1998.



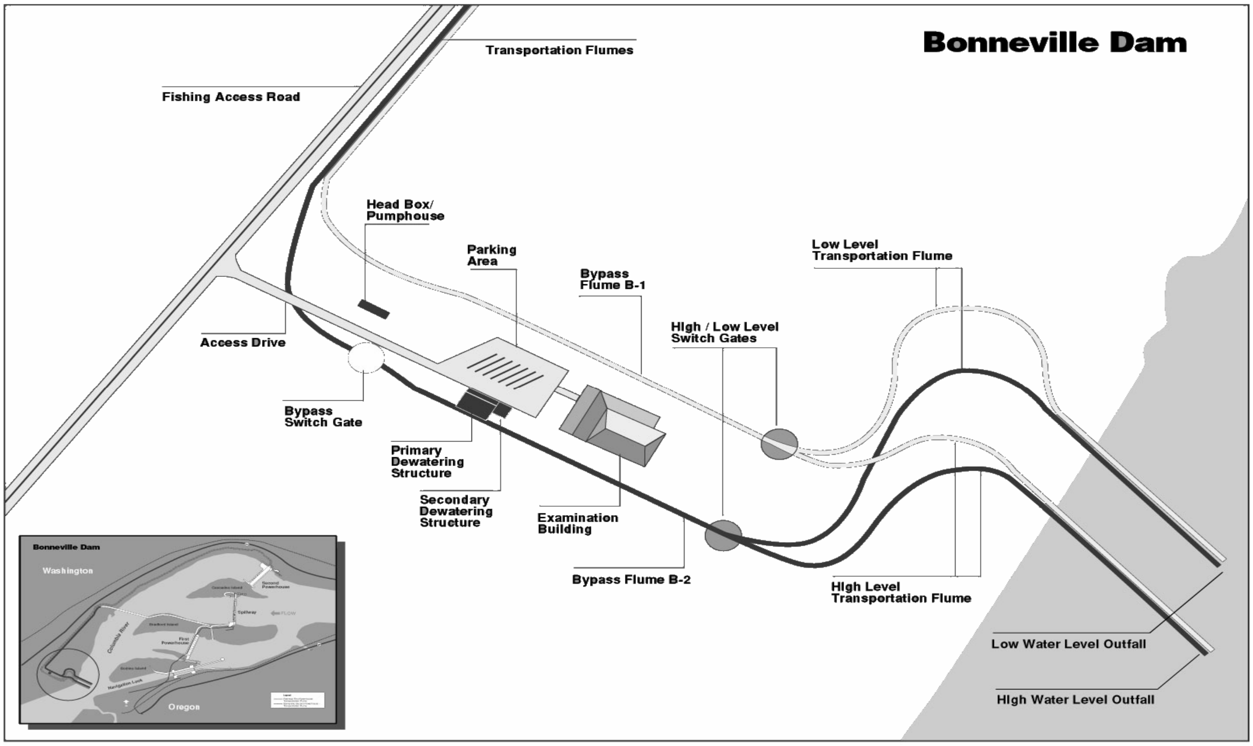


Figure B-9. Hamilton Island juvenile monitoring facility, 2000-present.

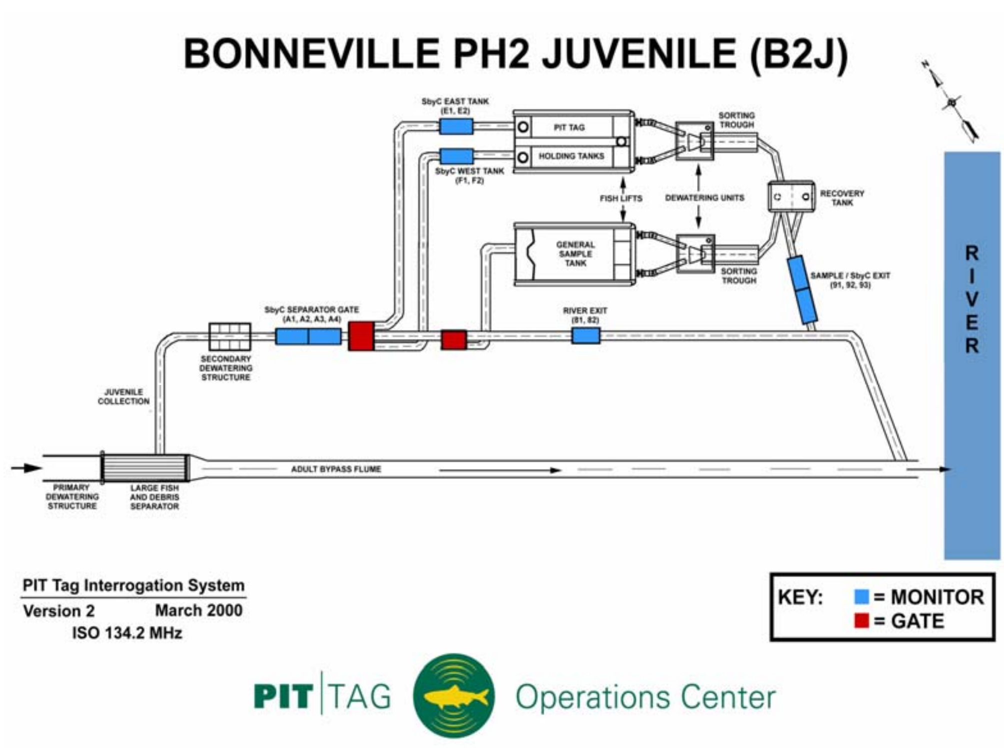


Figure B-10. Hamilton Island juvenile monitoring facility schematic, 2000-present.

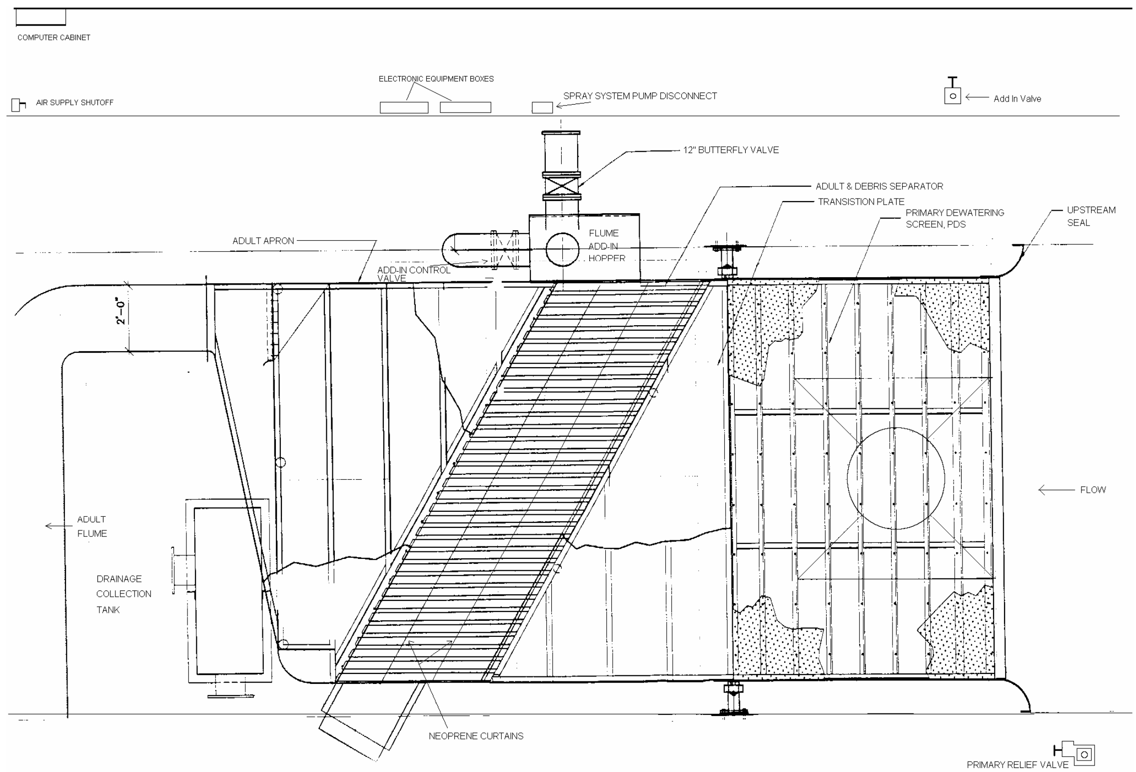


Figure B-11. PH2 PIT tag and sample collection system, top view, 1997-1998. This system was dismantled in 1999 to allow construction of new bypass at PH2.

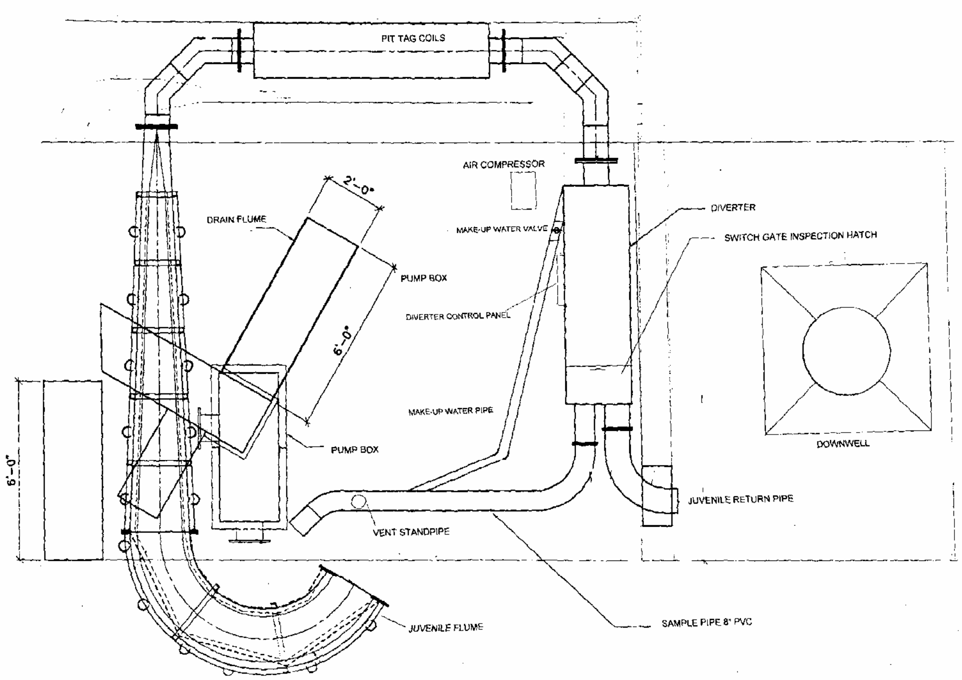


Figure B-12. PH2 PIT tag and collection system, lower level, 1997-1998. This system was dismantled in 1999 to allow construction of the new sampling system at PH2.

Table C-1. PH1 smolt monitoring program summary, 1986-present.

		Sampling	Sub-	Sample	**Yearling Chinook**			**Subyearling Chinook**					**Coho**				
Year	Dates	Effort	Sampling	Rate	Sample #	Collection	Index	Sample #[1]	Fry	Collection[1]	Fry	Index	Sample #	Fry	Collection	Fry	Index
1986	5/12-11/26	8hr, 5 d/wk	YES		9,495	48,282	NA	23,252		86,220		NA	11,538		54,181		NA
1987	3/13-11/20	8hr, 5 d/wk	YES		28,828	120,108	NA	61,925		371,000		NA	23,188		102,228		NA
1988	3/15-11/30	8hr/day	YES		26,955	301,479	365,812	96,413		580,644		724,102	40,750		419,286		599,194
1989	3/15-11/30	8hr/day	YES	.1-.25	27,935	223,134	435,455	98,521		1,332,736		1,756,794	29,746		257,244		491,618
1990	3/12-11/30	8hr/day	YES	.0167-.2	23,843	196,216	332,792	80,422		658,702		1,219,778	43,030		365,826		677,413
1991	3/15-11/30	8hr/day	YES	.0167-.2	29,374	242,016	609,411	83,189		604,368		1,257,388	23,842		216,330		575,098
1992	3/13-11/20	24hr/day	YES	.0167-.2	42,523	284,983	723,655	112,037	2,742	882,211	15,165	2,320,423	23,971		140,403		388,809
1993	3/17-11/24	24hr/day	YES	.0167-.2	52,623	715,905	2,168,019	130,615	5,659	1,181,615	61,457	4,339,394	28,243		392,627		1,250,698
1994	3/10-10/31	24hr/day	YES	.0167-.2	34,362	248,741	779,713	125,967	1,538	1,360,832	14,731	3,607,383	22,378	72	201,310	459	626,443
1995	3/11-10/31	24hr/day	YES	.0167-.2	19,557	500,804	1,776,344	60,356	1,917	994,015	30,440	3,406,412	11,868	156	301,950	1,389	1,104,471
1996	3/11-10/31	8hr/day	YES	.0167-.2	7,825	77,780	360,961	29,556	79	432,364	647	1,593,073	13,076	9	156,957	97	675,605
1997	3/17-10/30	8hr/day	YES	.0167-.2	5,938	56,891	286,666	44,024	459	342,192	3,761	1,501,962	12,346	13	128,031	105	706,780
1998	3/9-10/31	8hr/day	YES	.00833-.25	6,850	97,581	346,281	30,835	510	450,650	8,116	1,591,883	6,272	28	121,695	452	513,643
1999	3/13-10/31	8hr/day	YES	.00833-.25	15,279	165,918	638,606	35,637	154	474,874	1,451	1,692,665	8,411	10	98,370	64	375,644
2000[2]	4/3-8/31	6-8hr/day	NO		5,104			7,477	18				2,452	5			
2001[2]	4/3-7/31	6-8hr/day	NO		1,164			4,245	6				397	1			
2002[2]	4/8-7/23	1-8hr/day	NO		1,974			4,567	7				555	1			
2003[2]	4/8-6/24	1-8hr/day	NO		2,156			2,062	26				429	2			

		Sampling	Sub-	Sample	**Unclipped Steelhead[3]**			**Clipped Steelhead**			**Sockeye**			**Total**		
Year	Dates	Effort	Sampling	Rate	Sample #	Collection	Index	Sample #	Collection	Index	Sample #	Collection	Index	Sample #	Collection	Index
1986	5/12-11/26	8hr, 5d/wk	YES		3,753	19,181	NA				2,883	14,350	NA	50,921	222,214	NA
1987	3/13-11/20	8hr, 5d/wk	YES		8,760	38,306	NA				4,079	18,733	NA	126,780	650,375	NA
1988	3/15-11/30	8hr/day	YES		7,473	75,662	103,701				4,587	52,023	77,921	176,178	1,429,094	1,870,730
1989	3/15-11/30	8hr/day	YES	.1-.25	12,240	106,787	206,226				7,723	72,962	138,310	176,165	1,992,863	3,028,403
1990	3/12-11/30	8hr/day	YES	.0167-.2	3,894	36,812	62,826	5,525	64,400	65,056	4,537	42,633	81,403	161,251	1,364,589	2,439,268
1991	3/15-11/30	8hr/day	YES	.0167-.2	2,775	26,295	74,438	5,504	54,528	155,754	4,462	47,722	147,174	149,146	1,191,259	2,819,263
1992	3/13-11/20	24hr/day	YES	.0167-.2	2,837	16,503	46,098	3,767	21,915	62,486	638	3,872	10,835	185,773	1,349,887	3,552,306
1993	3/17-11/24	24hr/day	YES	.0167-.2	4,025	74,138	226,120	7,456	185,240	563,884	4,939	178,245	538,837	227,901	2,727,770	9,086,952
1994	3/10-10/31	24hr/day	YES	.0167-.2	3,730	29,796	93,520	3,981	33,827	105,693	2,965	27,945	87,146	193,383	1,902,451	5,299,898
1995	3/11-10/31	24hr/day	YES	.0167-.2	1,240	29,963	106,889	3,737	103,508	376,571	2,184	71,990	263,680	98,942	2,002,230	7,034,367
1996	3/11-10/31	8hr/day	YES	.0167-.2	1,885	22,787	101,655	5,083	58,825	254,448	703	7,239	28,513	58,128	755,952	3,014,255
1997	3/17-10/30	8hr/day	YES	.0167-.2	3,615	38,829	205,873	9,285	105,516	575,077	589	5,765	31,099	75,797	677,224	3,307,458
1998	3/9-10/31	8hr/day	YES	.00833-.25	2,587	40,862	159,916	3,294	57,078	237,299	1,737	26,963	114,564	51,575	794,829	2,963,585
1999	3/13-10/31	8hr/day	YES	.00833-.25	2,549	94,322	108,164	5,647	65,488	65,488	2,118	33,100	118,203	69,641	866,584	3,176,429
2000[2]	4/3-8/31	6-8hr, 3d/wk	NO		1,314			1,378			223			17,948		
2001[2]	4/3-7/31	6-8hr, 3d/wk	NO		91			25			9			5,931		
2002[2]	4/8-7/23	1-8hr, 3d/wk	NO		219			248			531			8,094		
2003[2]	4/8-6/24	1-8hr, 3d/wk	NO		161			268			466			5,542		

[1] Includes fry numbers.
[2] Sampling reduced to condition monitoring only, collection and index estimates not available.
[3] Unclipped and clipped steelhead were not differentiated prior to 1990.

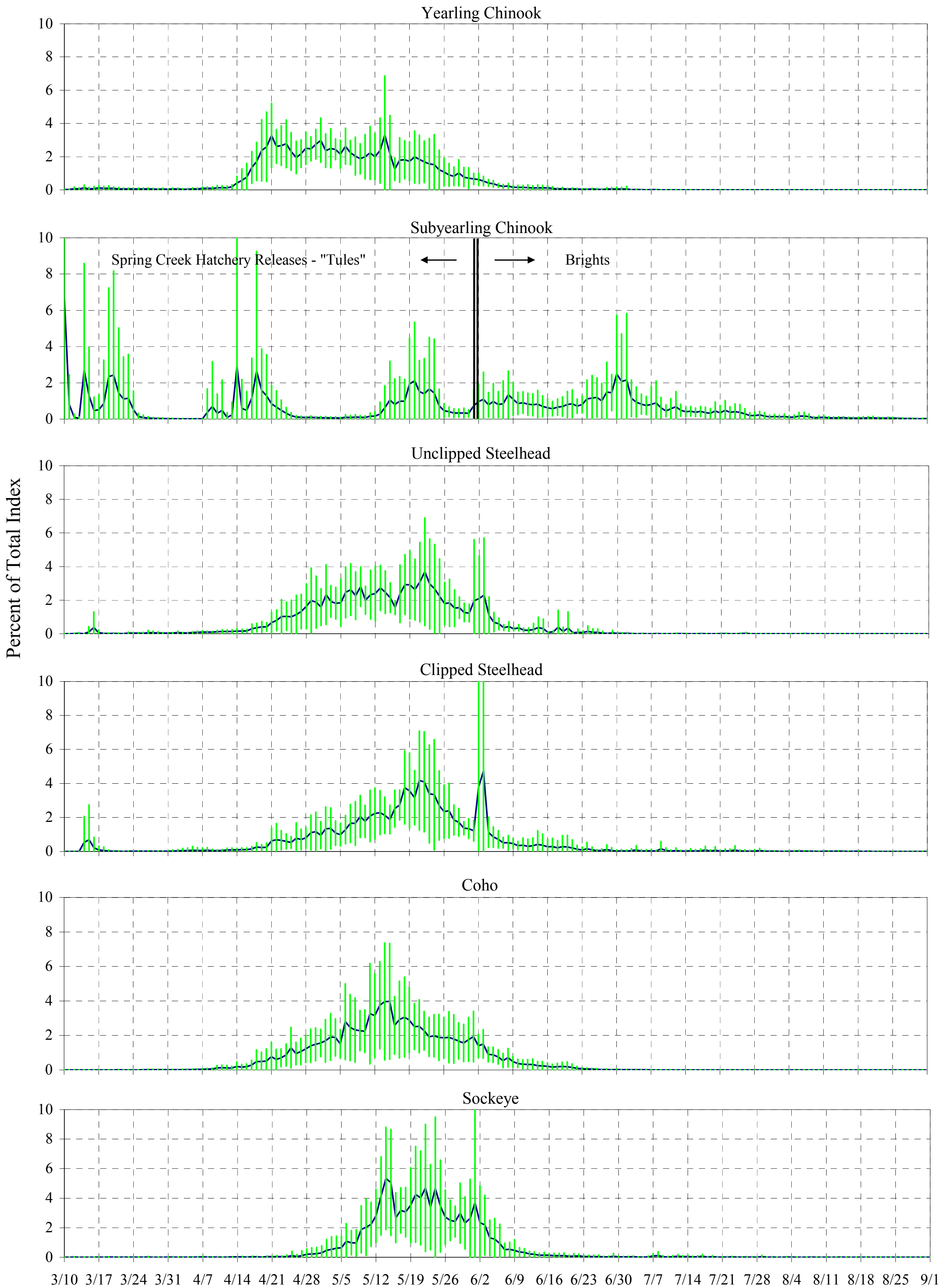


Figure C-1. PH1 daily passage, 1987-1999, as a percent of total index with the standard deviation.

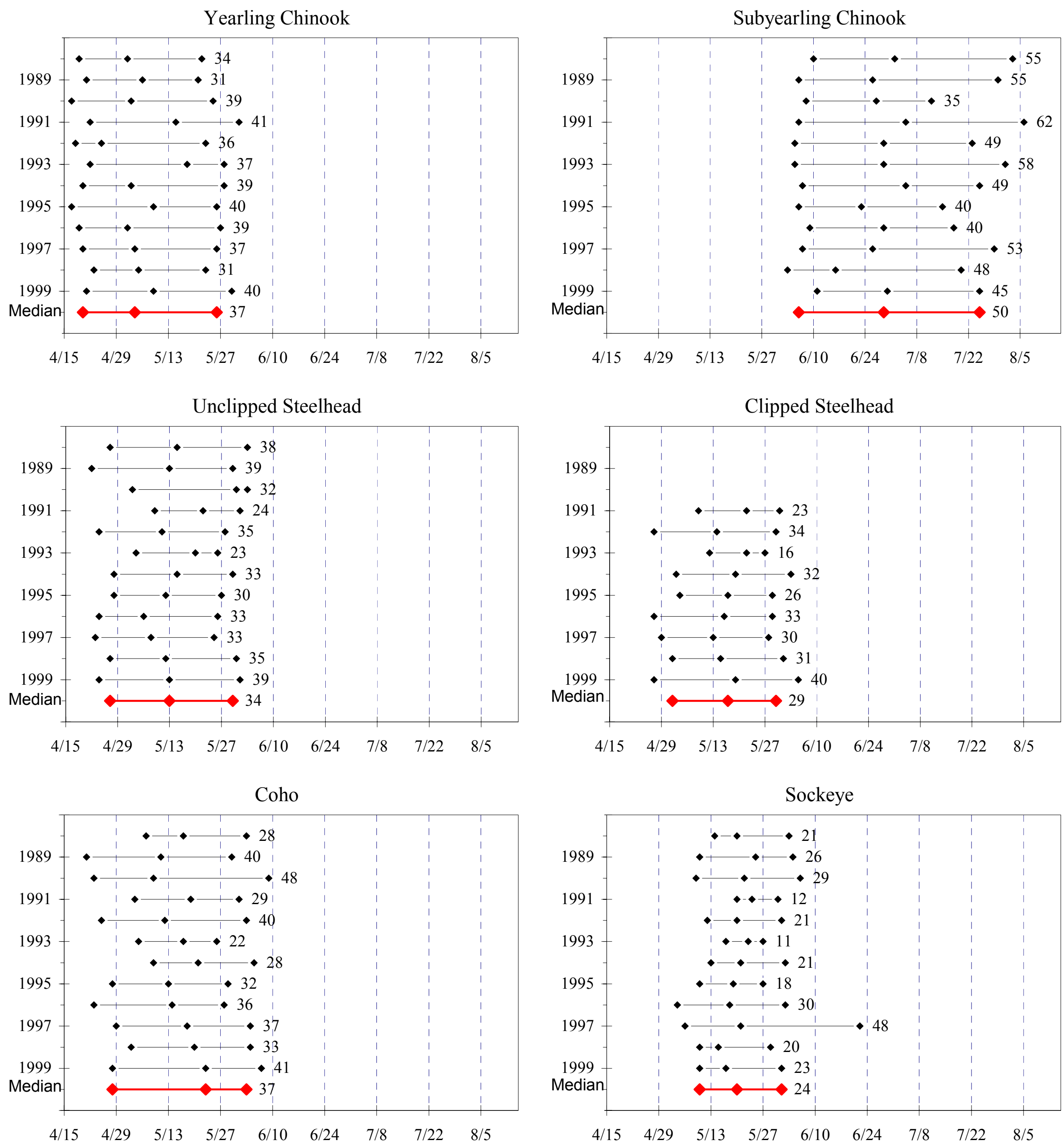


Figure C-2. PH1 10%, 50%, and 90% passage dates by species, and the median, 1988-1999. The duration between 10-90% dates (in days) is indicated for each year. Clipped and unclipped steelhead were not differentiated before 1991. Timing and duration calculations made only with PH2 data after 1999.

Table C-2. PH1 10%, 50%, and 90% passage dates by species, 1988-1999. This data collected at PH2 after 1999.

Yearling Chinook	10 %	50%	90 %	# of Days
1988	19-Apr	02-May	22-May	34
1989	21-Apr	06-May	21-May	31
1990	17-Apr	03-May	25-May	39
1991	22-Apr	15-May	01-Jun	41
1992	18-Apr	25-Apr	23-May	36
1993	22-Apr	18-May	28-May	37
1994	20-Apr	03-May	28-May	39
1995	17-Apr	09-May	26-May	40
1996	19-Apr	02-May	27-May	39
1997	20-Apr	4-May	26-May	37
1998	23-Apr	5-May	23-May	31
1999	21-Apr	9-May	30-May	40
MEDIAN	20-Apr	04-May	26-May	37
MIN	17-Apr	25-Apr	21-May	31
MAX	23-Apr	18-May	01-Jun	41

Subyearling Chinook - "Brights" Only	10 %	50%	90 %	# of Days
1988	10-Jun	02-Jul	03-Aug	55
1989	06-Jun	26-Jun	30-Jul	55
1990	08-Jun	27-Jun	12-Jul	35
1991	06-Jun	05-Jul	06-Aug	62
1992	05-Jun	29-Jun	23-Jul	49
1993	05-Jun	29-Jun	01-Aug	58
1994	07-Jun	05-Jul	25-Jul	49
1995	6-Jun	23-Jun	15-Jul	40
1996	9-Jun	29-Jun	18-Jul	40
1997	7-Jun	26-Jun	29-Jul	53
1998	3-Jun	16-Jun	20-Jul	48
1999	11-Jun	30-Jun	25-Jul	45
MEDIAN	06-Jun	29-Jun	25-Jul	50
MIN	03-Jun	16-Jun	12-Jul	35
MAX	11-Jun	05-Jul	06-Aug	62

Unclipped Steelhead[1]	10 %	50%	90 %	# of Days
1988	27-Apr	15-May	03-Jun	38
1989	22-Apr	13-May	30-May	39
1990	03-May	31-May	03-Jun	32
1991	09-May	22-May	01-Jun	24
1992	24-Apr	11-May	28-May	35
1993	04-May	20-May	26-May	23
1994	28-Apr	15-May	30-May	33
1995	28-Apr	12-May	27-May	30
1996	24-Apr	6-May	26-May	33
1997	23-Apr	8-May	25-May	33
1998	27-Apr	12-May	31-May	35
1999	24-Apr	13-May	1-Jun	39
MEDIAN	27-Apr	13-May	30-May	34
MIN	22-Apr	06-May	25-May	23
MAX	09-May	31-May	03-Jun	39

Clipped Steelhead[1]	10 %	50%	90 %	# of Days
1988				
1989				
1990				
1991	09-May	22-May	31-May	23
1992	27-Apr	14-May	30-May	34
1993	12-May	22-May	27-May	16
1994	03-May	19-May	03-Jun	32
1995	04-May	17-May	29-May	26
1996	27-Apr	16-May	29-May	33
1997	29-Apr	13-May	28-May	30
1998	2-May	15-May	1-Jun	31
1999	27-Apr	19-May	5-Jun	40
MEDIAN	02-May	17-May	30-May	29
MIN	27-Apr	13-May	27-May	16
MAX	12-May	22-May	05-Jun	40

Coho	10 %	50%	90 %	# of Days
1988	07-May	17-May	03-Jun	28
1989	21-Apr	11-May	30-May	40
1990	23-Apr	09-May	09-Jun	48
1991	04-May	19-May	01-Jun	29
1992	25-Apr	12-May	03-Jun	40
1993	05-May	17-May	26-May	22
1994	09-May	21-May	05-Jun	28
1995	28-Apr	13-May	29-May	32
1996	23-Apr	14-May	28-May	36
1997	29-Apr	18-May	4-Jun	37
1998	3-May	20-May	4-Jun	33
1999	28-Apr	23-May	7-Jun	41
MEDIAN	28-Apr	17-May	03-Jun	37
MIN	21-Apr	09-May	26-May	22
MAX	09-May	23-May	09-Jun	48

Sockeye	10 %	50%	90 %	# of Days
1988	14-May	20-May	3-Jun	21
1989	10-May	25-May	4-Jun	26
1990	9-May	22-May	6-Jun	29
1991	20-May	24-May	31-May	12
1992	12-May	20-May	1-Jun	21
1993	17-May	23-May	27-May	11
1994	13-May	21-May	2-Jun	21
1995	10-May	19-May	27-May	18
1996	4-May	18-May	2-Jun	30
1997	6-May	21-May	22-Jun	48
1998	10-May	15-May	29-May	20
1999	10-May	17-May	1-Jun	23
MEDIAN	10-May	20-May	01-Jun	24
MIN	04-May	15-May	27-May	11
MAX	20-May	25-May	22-Jun	48

[1] Unclipped and clipped steelhead were not differentiated before 1991 for index purposes.

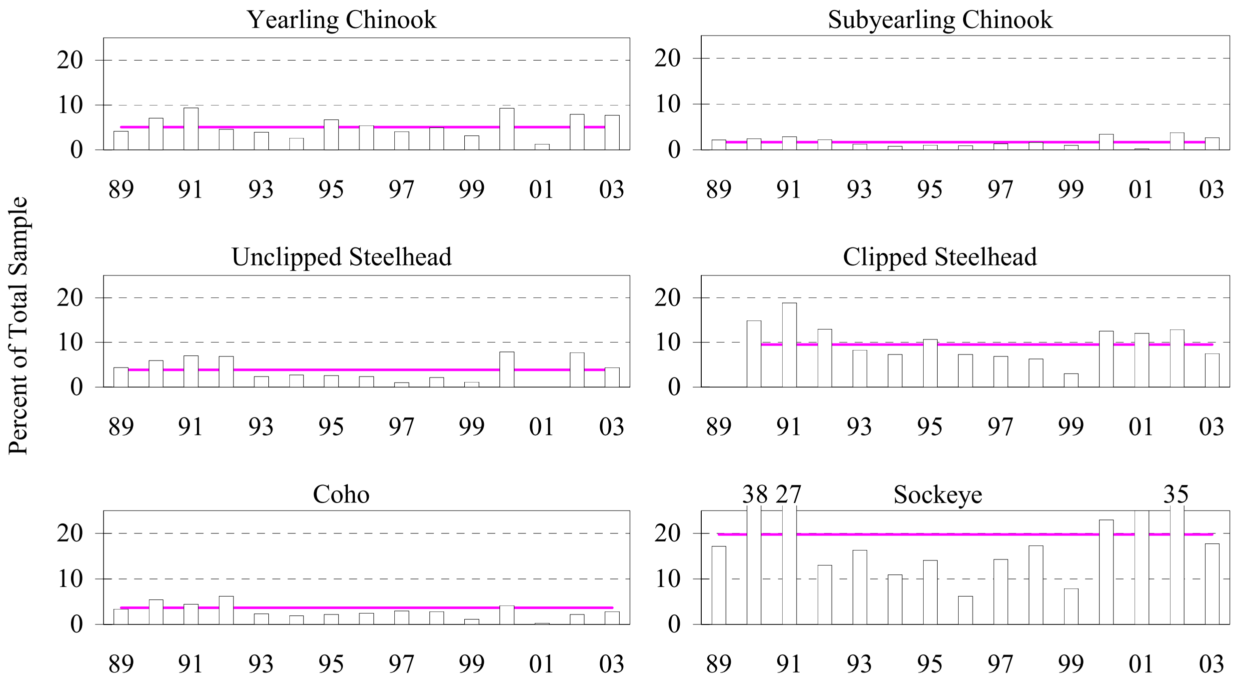


Figure C-3. PH1 annual descaling rates, 1989-present, horizontal line is the average. Clipped and unclipped steelhead were not differentiated before 1990.

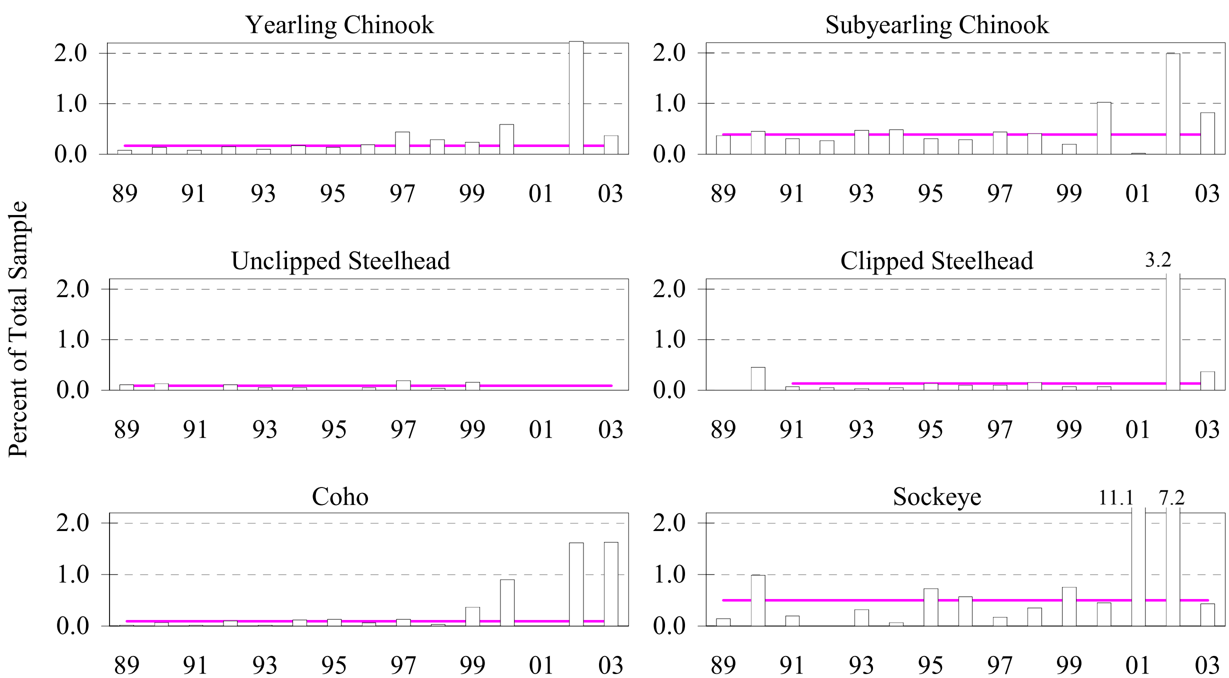


Figure C-4. PH1 annual mortality rates, 1989-present, horizontal line is the average. Clipped and unclipped steelhead were not differentiated before 1990.

Table C-3. PH1 annual descaling and mortality data, 1988-present.

	YEARLING CHINOOK					SUBYEARLING CHINOOK				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1989	27,934	1,164	4.2	22	0.1	98,571	2,119	2.2	361	0.4
1990	23,821	1,675	7.0	34	0.1	80,446	1,956	2.4	358	0.5
1991	29,409	2,741	9.3	24	0.1	83,240	2,383	2.9	257	0.3
1992[1]	42,523	1,952	4.6	62	0.2	112,037	2,517	2.3	301	0.3
1993[1]	52,623	2,050	3.9	51	0.1	130,616	1,657	1.3	611	0.5
1994[1]	34,361	896	2.6	58	0.2	125,967	999	0.8	600	0.5
1995[1]	19,557	1,310	6.7	27	0.1	60,356	651	1.1	189	0.3
1996	7,246	370	5.1	13	0.2	27,113	254	0.9	82	0.3
1997	5,938	239	4.0	26	0.4	44,024	595	1.4	192	0.4
1998	6,850	337	4.9	20	0.3	30,835	485	1.6	127	0.4
1999	16,279	482	3.2	37	0.2	35,637	339	1.0	71	0.2
2000[2]	5,104	471	9.3	30	0.6	7,477	253	3.4	77	1.0
2001[2]	1,164	15	1.3	0	0.0	4,245	10	0.2	1	0.0
2002[2]	1,974	153	7.9	44	2.2	4,567	170	3.8	91	2.0
2003[2]	2,156	166	7.7	8	0.4	2,062	54	2.6	17	0.8
TOTAL	303,741	15,120	5.0	515	0.2	941,547	16,047	1.7	3,655	0.4

	UNCLIPPED STEELHEAD[3]					CLIPPED STEELHEAD				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1989	12,240	536	4.4	13	0.1					
1990	3,894	232	6.0	5	0.1	5,521	818	14.9	25	0.5
1991	2,772	194	7.0	0	0.0	5,502	1,036	18.8	4	0.1
1992[1]	2,837	194	6.8	3	0.1	3,767	487	12.9	2	0.1
1993[1]	4,025	96	2.4	2	0.0	7,456	622	8.3	2	0.0
1994[1]	3,730	102	2.7	2	0.1	3,981	290	7.3	2	0.1
1995[1]	1,240	32	2.6	0	0.0	3,737	397	10.6	5	0.1
1996	1,821	44	2.4	1	0.1	5,075	369	7.3	5	0.1
1997	3,616	35	1.0	7	0.2	9,285	635	6.8	9	0.1
1998	2,587	56	2.2	1	0.0	3,294	208	6.3	5	0.2
1999	2,549	29	1.1	4	0.2	5,647	170	3.0	4	0.1
2000[2]	1,314	104	7.9	0	0.0	1,378	173	12.6	1	0.1
2001[2]	91	0	0.0	0	0.0	25	3	12.0	0	0.0
2002[2]	219	17	7.8	0	0.0	248	31	12.9	8	3.2
2003[2]	161	7	4.4	0	0.0	268	20	7.5	1	0.4
TOTAL	50,413	2,123	4.2	56	0.1	54,916	5,239	9.6	72	0.1

	COHO					SOCKEYE				
DATE	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1989	29,747	998	3.4	5	0.0	7,723	1,319	17.1	11	0.1
1990	43,032	2,325	5.4	30	0.1	4,537	1,710	38.1	45	1.0
1991	23,842	1,059	4.4	5	0.0	4,462	1,205	27.1	9	0.2
1992[1]	23,971	1,485	6.2	24	0.1	638	83	13.0	0	0.0
1993[1]	28,243	649	2.3	6	0.0	4,939	803	16.3	16	0.3
1994[1]	22,378	430	1.9	27	0.1	2,965	322	10.9	2	0.1
1995[1]	11,868	258	2.2	16	0.1	2,184	305	14.1	16	0.7
1996	12,689	320	2.5	8	0.1	694	43	6.2	4	0.6
1997	12,346	363	2.9	16	0.1	589	84	14.3	1	0.2
1998	6,272	176	2.8	2	0.0	1,737	299	17.3	6	0.3
1999	8,411	94	1.1	31	0.4	2,118	165	7.4	16	0.7
2000[2]	2,452	101	4.2	22	0.9	223	51	23.0	1	0.4
2001[2]	397	1	0.3	0	0.0	9	2	22.2	0	0.0
2002[2]	555	12	2.2	9	1.6	531	174	35.3	38	7.2
2003[2]	429	12	2.8	7	1.6	466	82	17.7	2	0.4
TOTAL	266,979	9,611	3.6	225	0.1	38,151	7,691	20.3	194	0.5

[1] Sampling in 1992-1995 was conducted 24 hours per day.
[2] Sampling was conducted three times weekly for GBT exams and condition monitoring purposes.
[3] Unclipped and clipped steelhead were not differentiated prior to 1990.

Table C-4. PH1 annual condition subsampling data, 1988-present, as a percent of total.

YEAR	No. Sampled	3-19% Descaled	INJURY					DISEASE				PREDATION	
			HD	OP	PE	BODY	HEM	PAR	COL	FUNG	BKD	BIRD	Other
Yearling Chinook													
1989	2327	8.0	NA	0.4	0.4	NA	1.1	NA	0.2	NA	0.3	0.2	0.4
1990	3111	9.6	NA	0.1	0.1	NA	0.8	NA	0.1	NA	0.5	0.2	0.6
1991	2158	5.4	NA	0.4	0.3	NA	0.6	NA	0.0	NA	0.2	0.2	0.4
1992	2190	6.4	NA	0.4	0.2	NA	0.7	NA	0.3	NA	0.4	0.9	0.5
1993	2934	14.2	NA	NA	0.6	NA	3.0	NA	0.5	NA	0.9	0.0	0.5
1994	4018	10.0	NA	NA	0.4	NA	1.8	NA	0.2	NA	0.8	0.0	1.1
1995	2648	14.3	8.1	1.2	1.4	0.2	4.8	0.8	1.0	0.0	0.9	1.1	1.0
1996	2305	12.8	NA	0.5	0.6	0.0	1.5	0.0	0.2	0.0	0.5	0.4	0.0
1997	1591	10.0	3.6	0.2	0.4	0.1	1.2	0.1	0.1	0.0	0.3	0.1	0.9
1998	1687	13.0	6.8	0.4	0.2	0.1	0.7	0.1	0.2	0.0	1.0	0.2	0.9
1999	3429	14.1	4.0	0.6	0.8	0.1	0.7	0.0	0.2	0.0	0.9	0.9	1.8
2000	2601	14.0	8.6	0.8	0.7	0.4	0.5	0.5	0.1	0.0	2.0	0.8	1.3
2001	1055	6.0	1.1	0.8	0.9	0.4	0.9	0.3	0.8	0.0	3.6	1.4	1.1
2002	1684	16.0	7.5	1.5	1.1	0.1	2.7	0.8	0.2	0.0	2.0	0.5	2.3
2003	1678	12.8	8.0	0.1	0.6	0.7	0.3	0.4	0.2	0.0	0.6	0.1	1.2
Subyearling Chinook													
1989	8481	4.6	NA	0.2	0.1	NA	1.3	NA	0.2	NA	0.0	0.1	0.0
1990	6929	1.9	NA	0.1	0.1	NA	0.6	NA	0.2	NA	0.1	0.3	0.3
1991	4404	2.5	NA	0.2	0.1	NA	0.4	NA	0.3	NA	0.0	0.5	0.1
1992	4422	3.6	NA	0.1	0.2	NA	0.3	NA	0.4	NA	0.0	0.8	0.5
1993	8343	7.8	NA	NA	0.4	NA	3.1	NA	0.3	NA	0.1	0.0	0.1
1994	7149	4.0	NA	NA	0.3	NA	0.9	NA	0.1	NA	0.1	0.0	0.1
1995	5230	5.4	2.3	0.3	0.4	0.1	2.0	0.1	0.2	0.0	0.1	0.2	0.1
1996	4080	4.6	NA	0.3	0.5	0.0	0.7	0.0	0.1	0.0	0.2	0.0	0.2
1997	4893	5.9	1.4	0.2	0.5	0.0	0.8	0.1	0.2	0.0	0.2	0.1	0.2
1998	3324	8.3	2.4	0.3	0.5	0.1	1.1	0.1	0.3	0.0	0.4	0.2	0.2
1999	4513	6.2	1.2	0.2	0.6	0.0	0.7	0.0	0.0	0.0	0.2	0.0	0.2
2000	1834	7.7	2.1	0.5	1.1	0.0	0.9	0.5	0.1	0.0	0.8	0.1	0.3
2001	1017	4.0	1.0	0.0	0.4	0.1	0.7	0.2	0.0	0.0	0.1	0.1	0.1
2002	1593	7.1	4.6	1.3	0.6	0.1	1.4	0.3	0.3	0.0	0.6	0.3	0.3
2003	522	7.3	3.1	0.0	0.8	0.6	1.1	0.6	0.0	0.0	0.4	0.2	0.0
Coho													
1989	2626	6.3	NA	0.4	0.2	NA	0.4	NA	0.2	NA	0.3	0.0	0.2
1990	3468	0.0	NA	0.1	0.1	NA	0.4	NA	0.1	NA	0.4	0.1	0.5
1991	1967	1.8	NA	0.2	0.2	NA	0.4	NA	0.2	NA	0.2	0.1	0.3
1992	1883	5.5	NA	0.3	0.4	NA	0.3	NA	0.2	NA	0.6	0.0	0.3
1993	2227	5.3	NA	NA	0.4	NA	1.9	NA	0.3	NA	0.9	0.0	0.3
1994	2725	6.7	NA	NA	0.2	NA	1.1	NA	0.1	NA	1.1	0.0	0.3
1995	2574	7.6	2.2	0.4	0.3	0.2	3.1	0.1	0.9	0.1	1.1	0.1	0.5
1996	2720	10.2	NA	0.2	0.2	0.0	0.6	0.0	0.2	0.1	0.4	0.0	1.0
1997	2347	7.9	2.6	0.3	0.1	0.2	0.6	0.0	0.1	0.0	0.3	0.0	0.6
1998	1960	7.6	3.1	0.4	0.3	0.1	0.4	0.1	0.2	0.0	1.1	0.1	0.4
1999	2643	6.4	1.5	0.3	0.4	0.1	0.2	0.0	0.2	0.0	3.7	0.1	0.7
2000	178	5.1	1.7	0.6	0.6	0.0	1.7	0.0	0.6	0.0	2.8	0.0	0.6
2001	221	6.3	0.0	0.0	0.9	0.0	0.5	0.0	0.5	0.0	0.9	0.0	0.5
2002	539	11.3	2.4	3.2	0.6	0.2	1.9	0.2	0.6	0.0	4.1	0.2	1.1
2003	366	7.4	2.5	0.0	0.3	1.4	1.1	0.5	0.5	0.0	1.6	0.0	1.6

Injury includes: HD- Head Injury; OP - Opercula Injury; PE - Pop Eye; BD - Body Injury; and HM - Hemorrhage
Disease includes: PAR - Parasites (mostly trematodes and copepods); COL - Columnaris; FUN - Fungus; and BKD - Bacterial Kidney Disease symptoms
Predation includes: BIRD - Marks from bird strikes; OT - Marks from other predators, including lamprey and other fish

Table C-4. PH1 annual condition subsampling data, 1988-present, continued.

YEAR	No. Sampled	3-19% Descaled	INJURY					DISEASE				PREDATION	
			HD	OP	PE	BODY	HEM	PAR	COL	FUNG	BKD	BIRD	Other
Unclipped Steelhead													
1989	2319	10.5	NA	0.4	0.7	NA	1.2	NA	3.3	NA	1.0	0.0	2.5
1990	1042	10.1	NA	0.4	0.2	NA	1.4	NA	4.0	NA	1.2	0.0	2.1
1991	706	2.5	NA	0.8	0.7	NA	1.6	NA	8.2	NA	0.7	0.0	1.6
1992	590	5.6	NA	0.2	0.2	NA	0.7	NA	5.6	NA	0.3	0.0	2.2
1993	1250	6.6	NA	NA	0.2	NA	1.6	NA	6.6	NA	0.7	0.0	5.8
1994	1429	9.2	NA	NA	0.5	NA	2.6	NA	8.3	NA	0.5	0.0	2.8
1995	419	9.8	2.4	1.4	1.2	0.2	2.9	0.0	19.3	0.0	0.2	0.0	3.1
1996	789	9.0	NA	0.3	0.6	0.0	0.4	0.0	8.1	0.0	0.3	0.0	1.5
1997	1306	6.9	1.0	0.6	0.8	0.0	1.2	0.0	4.6	0.0	0.2	0.0	2.1
1998	768	10.9	3.9	0.7	0.5	0.0	0.9	0.0	4.6	0.0	0.4	0.0	2.0
1999	1067	9.4	1.3	0.3	0.5	0.0	0.5	0.0	9.7	0.0	0.8	0.0	1.8
2000	1022	13.8	6.7	0.9	0.9	0.1	0.9	0.4	8.7	0.1	0.9	0.0	6.4
2001	92	1.5	0.0	0.0	0.5	0.0	0.0	0.5	7.4	0.0	0.0	0.0	0.0
2002	204	26.0	7.8	1.0	2.0	0.0	3.9	0.0	6.4	0.0	2.0	0.0	6.4
2003	153	21.6	3.9	0.0	1.3	0.7	3.9	0.0	3.3	0.0	0.7	0.0	3.9
Clipped Steelhead													
1989													
1990	1366	21.5	NA	0.9	0.7	NA	1.5	NA	0.1	NA	3.1	0.0	6.1
1991	1024	9.7	NA	0.3	4.4	NA	0.9	NA	0.2	NA	0.8	0.2	3.8
1992	735	11.0	NA	0.4	3.0	NA	1.1	NA	0.4	NA	1.2	0.0	4.8
1993	1669	16.1	NA	NA	1.9	NA	3.2	NA	2.2	NA	1.4	0.0	0.0
1994	1595	21.6	NA	NA	3.1	NA	3.6	NA	0.9	NA	0.6	0.0	8.4
1995	1278	25.7	10.9	1.6	3.4	0.2	5.7	0.2	2.1	0.0	3.1	0.1	8.3
1996	1789	27.6	NA	0.3	3.5	0.0	2.1	0.0	0.1	0.0	0.8	0.1	10.0
1997	1978	25.3	7.4	1.1	2.7	0.2	2.1	0.1	0.1	0.2	0.4	0.0	6.8
1998	1011	25.3	9.3	0.7	2.8	0.0	2.1	0.0	0.3	0.0	1.6	0.0	7.5
1999	2158	19.3	3.7	0.3	3.1	0.0	0.9	0.0	0.4	0.0	1.0	0.0	5.7
2000	1057	20.1	11.5	0.9	2.6	0.1	1.9	0.5	0.5	0.0	0.6	0.0	11.5
2001	23	13.0	8.7	0.0	8.7	0.0	0.0	4.3	4.3	0.0	0.0	0.0	8.7
2002	238	32.4	11.8	2.9	4.6	0.0	8.4	0.4	1.7	0.0	5.9	0.0	9.2
2003	261	34.1	7.3	0.8	4.6	0.4	2.7	0.4	0.8	0.0	3.8	0.0	0.8
Sockeye													
1989	1397	16.1	NA	0.5	0.5	NA	0.4	NA	0.0	NA	0.1	0.1	0.1
1990	1425	14.9	NA	1.3	0.8	NA	0.5	NA	0.1	NA	0.1	0.1	0.1
1991	621	11.3	NA	1.0	2.3	NA	0.8	NA	0.0	NA	0.3	0.0	0.3
1992	131	17.6	NA	0.8	2.3	NA	0.8	NA	0.0	NA	0.0	0.0	0.0
1993	940	23.8	NA	NA	2.3	NA	3.1	NA	0.3	NA	0.4	0.0	0.2
1994	1047	26.6	NA	NA	1.9	NA	1.4	NA	0.0	NA	0.3	0.0	0.2
1995	829	23.9	14.1	0.8	2.4	0.1	1.1	0.2	0.0	0.0	0.7	0.0	0.2
1996	307	13.4	NA	0.0	1.3	0.0	1.6	0.0	0.3	0.0	0.0	0.0	0.0
1997	215	25.6	15.3	1.4	2.8	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
1998	595	26.6	18.8	2.0	2.9	0.2	0.3	0.3	0.0	0.0	1.2	0.0	0.0
1999	869	31.4	7.8	1.6	3.5	0.0	0.3	0.0	0.0	0.0	0.3	0.0	0.1
2000	18	27.8	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	5	40.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2002	479	33.8	33.8	7.7	5.6	0.0	5.4	3.3	0.0	0.0	1.5	0.0	0.6
2003	267	26.6	22.8	0.0	1.9	1.9	0.0	0.4	0.0	0.0	0.7	0.0	0.0

Injury includes: HD- Head Injury; OP - Opercula Injury; PE - Pop Eye; BD - Body Injury; and HM - Hemorrhage

Disease includes: PAR - Parasites (mostly trematodes and copepods); COL - Columnaris; FUN - Fungus; and BKD - Bacterial Kidney Disease symptoms

Predation includes: BIRD - Marks from bird strikes; OT - Marks from other predators, including lamprey and other fish

Table C-5. PH1 external mark recapture data, 2003.

Species	Location	Color	Release River	Release Number	Number Recaptured
Yearling Fall Chinook	Left	Blue	Snake River	150,000	1
	Right	Green, AD	Snake River	150,000	1
Yearling Spring Chinook	Right	Red, NC	Yakima and Tucannon R.	273,682	9
Yearling Unknown Chinook	Left	Red, AD	Snake and Wallowa R.	550,000	10
	Left	Green, AD and NC	Clearwater, Grande Ronde, Yak. R.	364,574	9
Summer Steelhead	Right	Green	Wenatchee and Tucannon R.	66,868	1
	Right	Orange	Wenatchee River	156,430	5
	Left	Red	Wenatchee River	112,943	1
	Left	Green	Touchet and Wenatchee R.	47,869	3
	Left	Orange	Wenatchee River	156,430	1
			Total Elastomer tags =	**2,028,796**	**41**

Freeze Brands

Species	Location	Code	Orient.	Release River	Release number	Number Recaptured
Summer Steelhead	Left Dorsal (LD)	IC	1	Grande Ronde	40,000	1
				Total Freeze Brands=	**40,000**	**1**

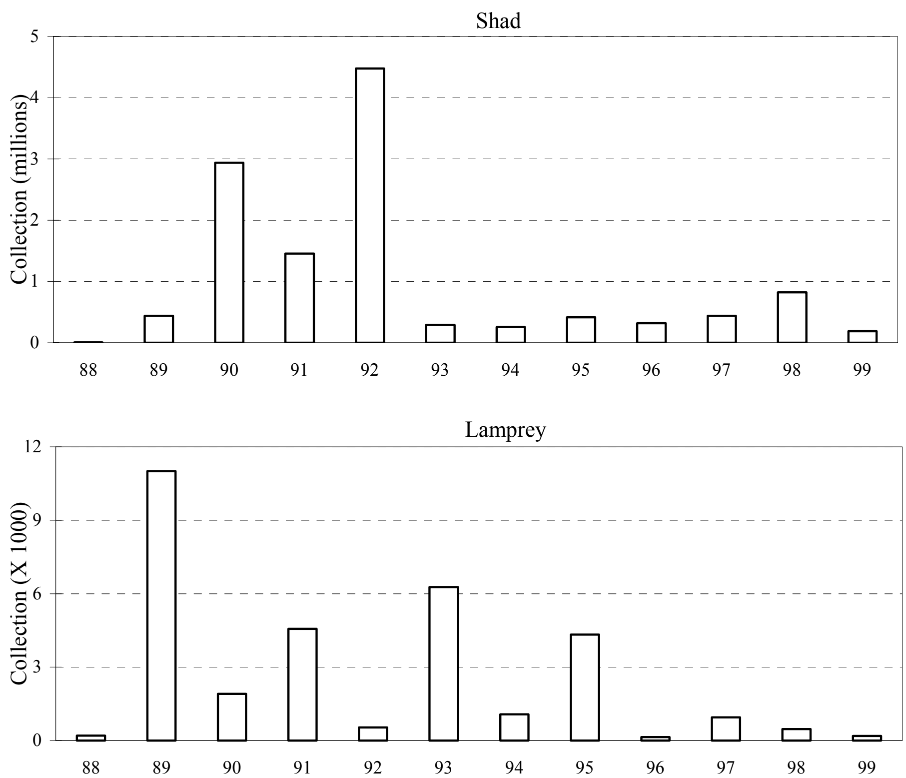


Figure C-5. PH1 juvenile shad and lamprey collection totals, 1988-1999. Recording of collection detail ceased in 2000 when sampling began in the new juvenile monitoring facility.

Table C-6. PH1 incidental collection summary, 1989-present.

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000*	2001	2002	2003
American shad (Adult)	39		8	46	78	85	1,130	104	1,097	64	75	5		11	1
American shad	435,653	2,939,363	1,481,768	4,479,820	288,463	252,474	414,487	318,190	437,715	820,864	187,300	493	1		2
Bluegill/ Pumpkinseed							283	167	235	530	31	1		1	
Bullhead							33	5	10	12	12	1			
Carp									630	16	18			1	
Channel catfish										4	259	2			1
Chiselmouth							54	11	25	4	31				
Crappie							54	20	87	117	8				
Cutthroat trout										10	4				
Kokanee							597		82	9	53			1	
Largemouth bass							60	56	57	4	12				
Northern pikeminnow	698	520	893	672	264	311	979	21	50	124	47	3	2	3	1
Pacific lamprey (Adult)	63		4	86	148	47	213	60	48	26	23	3	5		
Pacific lamprey (Brown)							118			14	4	4		1	
Pacific lamprey (Silver)	34,756	1,909	4,571	531	6,269	1,074	4,216	146	945	450	185	3		3	14
Peamouth	1,413	224	853	1,053	1,603	4,669	2,227	823	1,175	899	385	178	1	1	3
Rainbow trout										6	34				
Redside shiner	384	56	224	67	377	269	677	259	128	39	85			1	
Sand roller							194			11	28			2	
Sculpin	193	47	12	136	268	56	233	60	87	4	21	1	43	5	
Smallmouth bass	5	88	31	162	251	122	567	59	805	52	43				
Sucker							218	150	122	99	18				
Threespine stickleback	2,473	4,527	2,006	6,581	6,583	78,779	5,931	88	175	81	91	8	6	498	8
Walleye	3	20	4	15	13										
White sturgeon										4					1
Whitefish	34	58	121	41	75	65	665	73	113	84	10				
Yellow perch									87		7	1		1	

Note: Incidental catch has not been expanded to collection since 2000 in PH1.

Table C-7. PH1 gas bubble trauma (GBT) examination summary, 2003. Exams performed in PH2 after 23 July.

			Incidence of Gas Bubble Trauma symptoms					
			% of monthly sample			**Smolt Affected**		Monthly %
Month	**Species**	**Sample Size**	Eyes	unpaired fins ranks 1, 2	unpaired fins ranks 3, 4	Number	Percent	of Season Totals
April	Spring Chinook	500	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Unclipped Steelhead	36	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Clipped Steelhead	15	0.00%	0.00%	0.00%	0	0.00%	0.00%
Monthly Total		551	0.00%	0.00%	0.00%	0	0.00%	**0.00%**
May	Spring Chinook	736	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Unclipped Steelhead	31	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Clipped Steelhead	54	1.85%	0.00%	0.00%	1	1.85%	100.00%
Monthly Total		821	0.12%	0.00%	0.00%	1	0.12%	**100.00%**
June	Spring Chinook	77	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Fall Chinook	509	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Unclipped Steelhead	38	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Clipped Steelhead	89	0.00%	0.00%	0.00%	0	0.00%	0.00%
Monthly Total		636	0.00%	0.00%	0.00%	0	0.00%	**0.00%**
July	Fall Chinook	808						
Monthly Total		808	0.00%	0.00%	0.00%	0	0.00%	**0.00%**
August	Fall Chinook	657						
Monthly Total		657	0.00%	0.00%	0.00%	0	0.00%	**0.00%**
Season Totals	Spring Chinook	1236	0.00%	0.00%	0.00%	0	0.00%	
	Fall Chinook	1974	0.00%	0.00%	0.00%	0	0.00%	
	Unclipped Steelhead	105	0.00%	0.00%	0.00%	0	0.00%	
	Clipped Steelhead	158	0.63%	0.00%	0.00%	1	0.63%	
Season Total		3473	0.03%	0.00%	0.00%	**1**	**0.03%**	

NOTE: GBT symptoms were ranked as follows: 0 = 0% coverage, 1 = 1-5% coverage, 2 = 6-25% coverage, 3 = 26-50% coverage, and 4 = greater than 50% coverage.

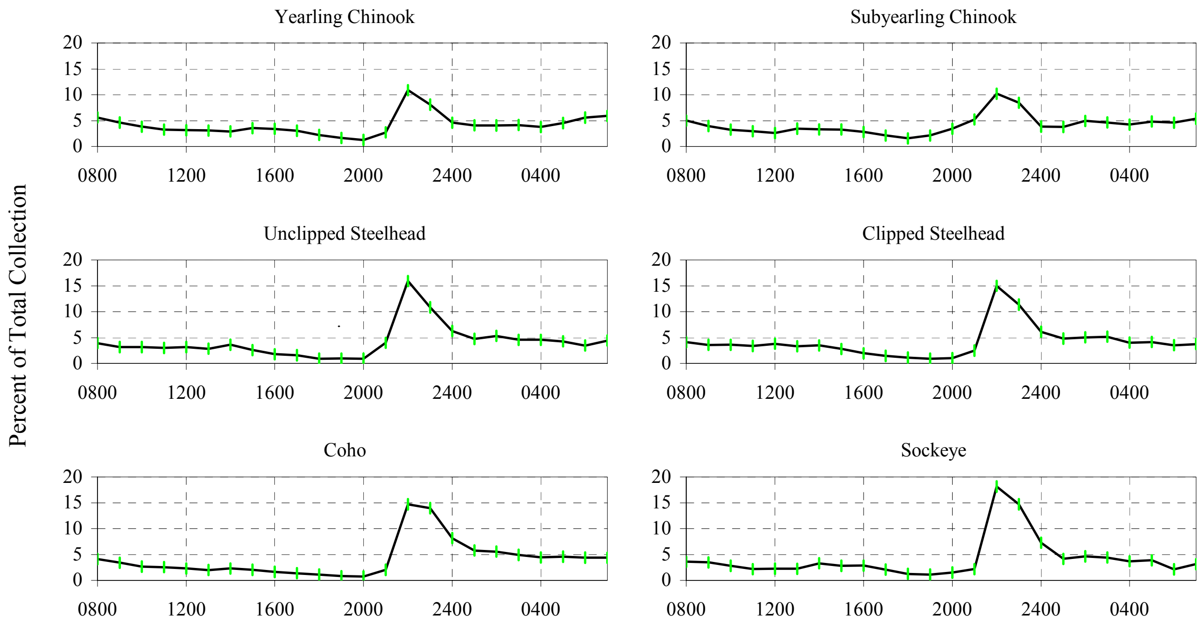


Figure C-6. PH1 average diel passage, 1992-1995, with standard deviation.

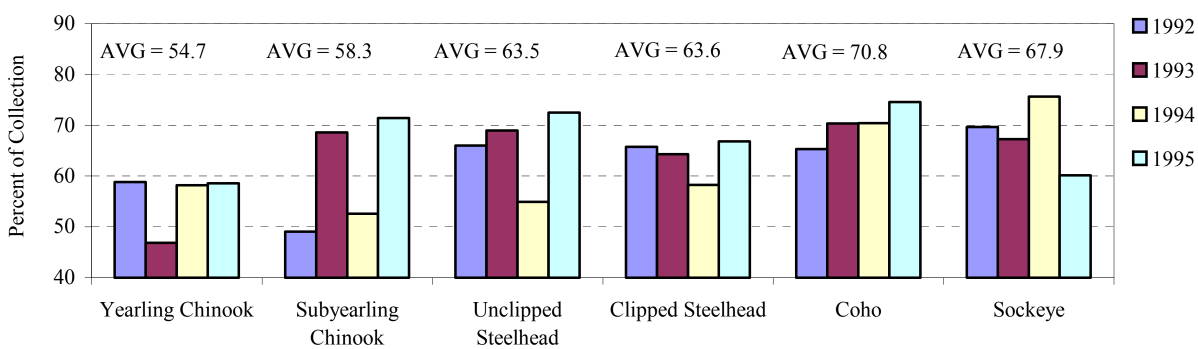


Figure C-7. PH1 percent night passage (1800-0600), 1992-1995, by species.

Table C-8. PH1 percent night passage (1800-0600) for 1992-95.

YEAR	Yearling Chinook	Subyearling Chinook	Unclipped Steelhead	Clipped Steelhead	Coho	Sockeye	All Species Combined
1992	58.8	49.1	66.0	65.7	65.3	69.7	53.4
1993	46.9	68.6	68.9	64.3	70.4	67.3	62.9
1994	58.2	52.6	54.9	58.2	70.4	75.6	56.3
1995	58.6	71.4	72.5	66.8	74.6	60.2	68.1
AVG	54.7	58.3	63.5	63.6	70.8	67.9	59.8
MIN	46.9	49.1	54.9	58.2	65.3	60.2	53.4
MAX	58.8	71.4	72.5	66.8	74.6	75.6	68.1

Table C-9. PH1 percent of total passage per hour, 1992-1995.

Yearling Chinook

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	5.8	4.5	3.8	3.2	3.1	3.0	2.9	3.6	3.4	3.1	2.3	1.7	1.2	2.5	10.5	7.8	4.5	4.1	4.0	4.1	3.8	4.7	5.8	6.4
MIN	4.4	3.4	3.1	2.7	2.5	2.4	2.4	2.8	3.1	2.5	1.9	1.4	1.0	1.5	7.9	6.6	3.5	3.5	3.1	3.5	3.4	3.6	4.3	3.8
MAX	6.7	5.4	4.8	4.0	4.0	3.6	3.6	4.3	3.8	3.9	2.6	2.2	1.5	3.9	12.9	10.5	5.2	4.7	5.7	4.5	4.3	6.2	6.8	7.7

Subyearling Chinook

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	5.2	4.3	3.4	3.0	2.7	3.3	3.5	3.6	3.0	2.1	1.6	1.8	3.1	5.0	10.1	8.1	3.6	3.5	4.7	4.6	4.2	4.8	4.6	6.0
MIN	3.2	2.7	2.2	2.3	2.1	2.0	1.9	2.1	1.8	1.6	1.3	0.9	0.6	2.4	7.4	6.1	3.1	2.6	3.1	3.9	4.0	4.5	4.0	3.0
MAX	6.5	5.1	4.1	4.0	3.3	5.1	4.4	4.5	4.1	3.0	1.8	4.8	7.7	10.2	14.0	11.9	4.6	5.0	8.7	5.7	4.7	5.2	6.0	7.1

Unclipped Steelhead

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	4.4	3.4	3.3	3.1	3.3	3.1	3.7	2.8	2.0	1.7	1.0	0.9	0.9	3.3	14.8	10.0	6.0	4.9	5.1	4.5	4.7	4.5	3.8	4.8
MIN	2.2	2.0	2.4	2.1	2.0	1.9	2.7	2.2	1.1	1.5	0.7	0.7	0.7	2.6	11.9	8.1	5.5	4.1	3.0	2.8	3.0	2.8	2.4	2.8
MAX	5.5	4.7	4.4	3.7	4.1	4.4	4.4	3.3	2.4	1.8	1.2	1.3	1.4	6.5	19.4	15.3	6.8	6.2	7.0	6.4	6.7	6.5	5.4	5.5

Clipped Steelhead

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	4.2	3.7	3.6	3.3	3.8	3.2	3.2	2.8	2.1	1.6	1.1	0.9	1.0	2.2	14.0	9.4	5.8	5.1	5.7	5.9	4.8	5.0	3.8	3.9
MIN	3.5	2.8	3.1	2.5	3.2	2.6	2.3	2.3	1.3	1.3	1.0	0.8	0.9	1.5	11.0	6.5	5.5	4.3	3.6	3.9	2.7	3.0	2.4	2.4
MAX	4.6	4.4	4.7	4.4	4.0	3.9	4.3	3.7	2.6	1.8	1.3	1.1	1.2	3.4	20.8	16.1	6.9	5.7	6.6	7.1	6.4	7.1	4.6	4.6

Coho

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	3.9	3.3	2.5	2.3	2.2	2.0	2.3	2.1	1.6	1.3	1.1	0.8	0.8	1.8	14.5	13.8	8.0	6.0	5.8	5.2	4.8	5.0	4.4	4.6
MIN	2.7	2.1	2.1	2.1	1.9	1.7	2.1	1.7	1.2	0.8	0.9	0.5	0.4	0.3	11.1	8.1	7.2	4.8	3.5	3.2	2.7	2.7	2.9	2.7
MAX	5.5	4.9	3.6	3.4	2.9	2.2	2.6	2.4	2.0	2.0	1.7	1.2	1.1	3.9	18.1	18.5	9.2	6.7	7.4	6.4	6.1	6.1	7.4	5.8

Sockeye

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	3.9	2.8	2.5	2.5	2.1	2.1	3.1	2.9	2.7	2.4	1.6	1.5	1.7	2.7	17.3	10.6	5.8	4.7	5.8	5.2	4.7	4.8	3.2	3.5
MIN	1.7	1.6	1.9	1.6	1.3	1.3	2.5	1.6	2.1	0.4	0.4	0.1	0.1	0.1	14.4	5.1	3.3	3.1	2.9	2.9	1.8	1.9	0.4	2.2
MAX	5.0	5.8	4.5	2.8	3.5	3.9	4.9	5.4	4.7	4.6	2.5	2.7	3.4	5.4	21.0	26.1	11.5	5.4	7.0	6.1	5.5	5.7	4.3	3.9

All species combined

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
AVG	5.1	4.1	3.3	2.9	2.7	3.0	3.2	3.3	2.9	2.2	1.6	1.6	2.3	3.8	11.2	9.0	4.6	4.1	4.8	4.7	4.2	4.8	4.7	5.7
MIN	3.3	2.7	2.5	2.5	2.4	2.3	2.3	2.8	2.3	2.1	1.5	0.9	0.8	3.0	9.1	6.6	4.3	3.2	3.3	4.3	3.7	4.1	3.8	3.4
MAX	6.0	4.8	4.0	3.8	3.2	4.2	3.7	3.8	3.5	2.7	1.8	3.0	4.1	5.6	14.8	10.0	5.3	5.0	7.4	5.3	4.6	5.1	6.1	6.8

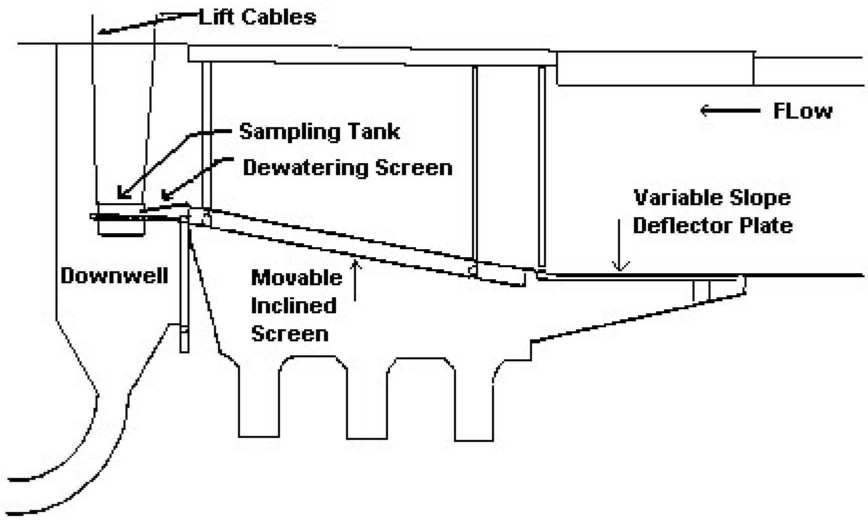


Figure C-8. PH1 inclined screen sampling system, 1986-present.

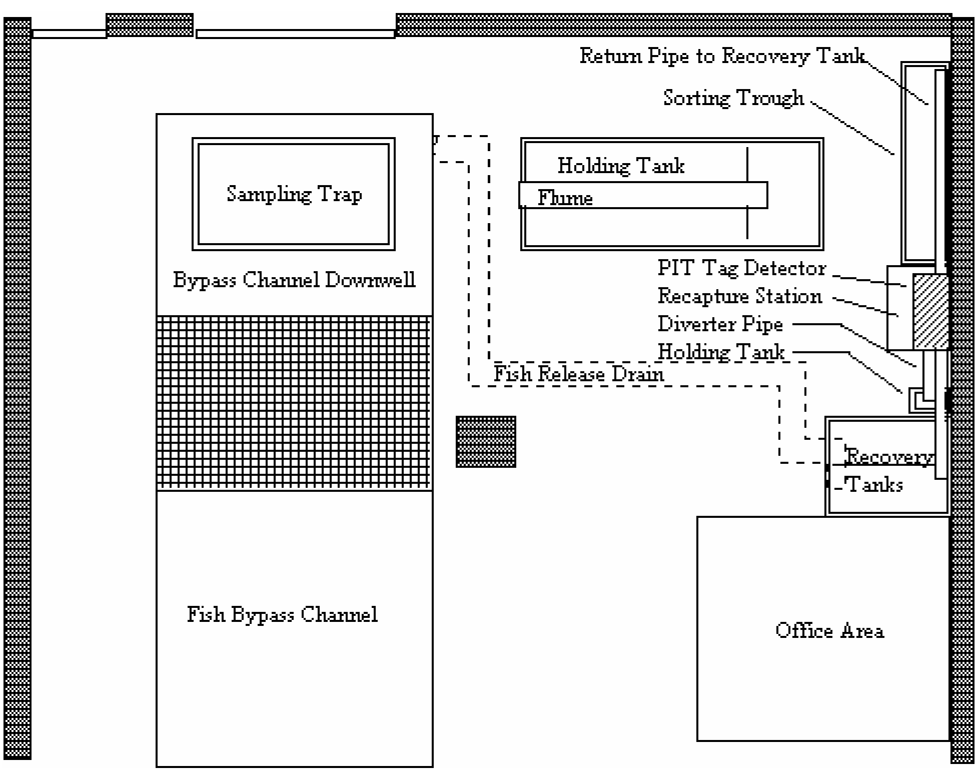


Figure C-9. PH1 laboratory layout, 1986-present.

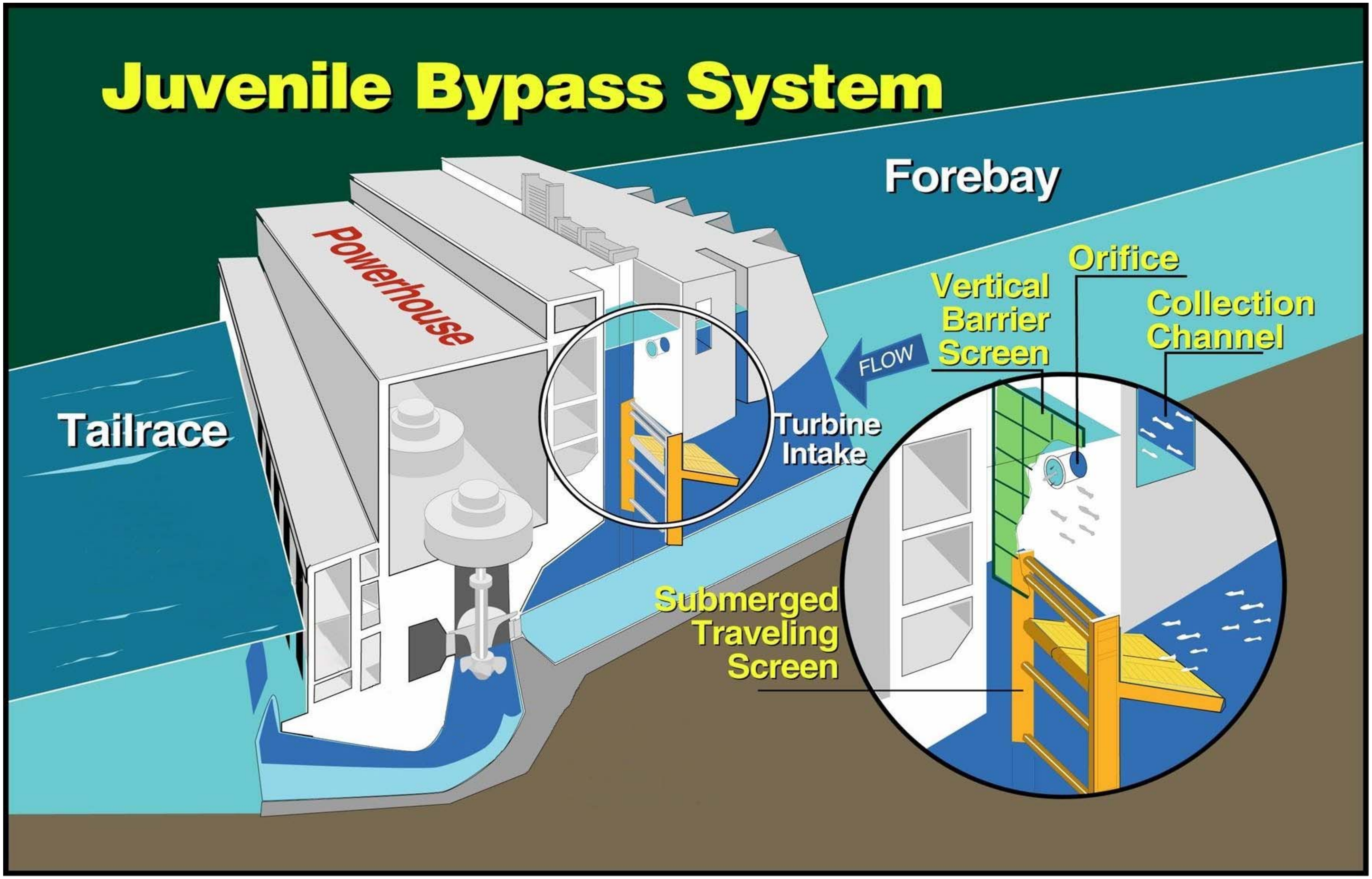


Figure C-10. Typical Submerged Traveling Screen Bypass System in use at Bonneville and John Day Dams. Photo courtesy of the USACE.